HYT

SERVICE MANUAL

TWO-WAY RADIO

TC-320

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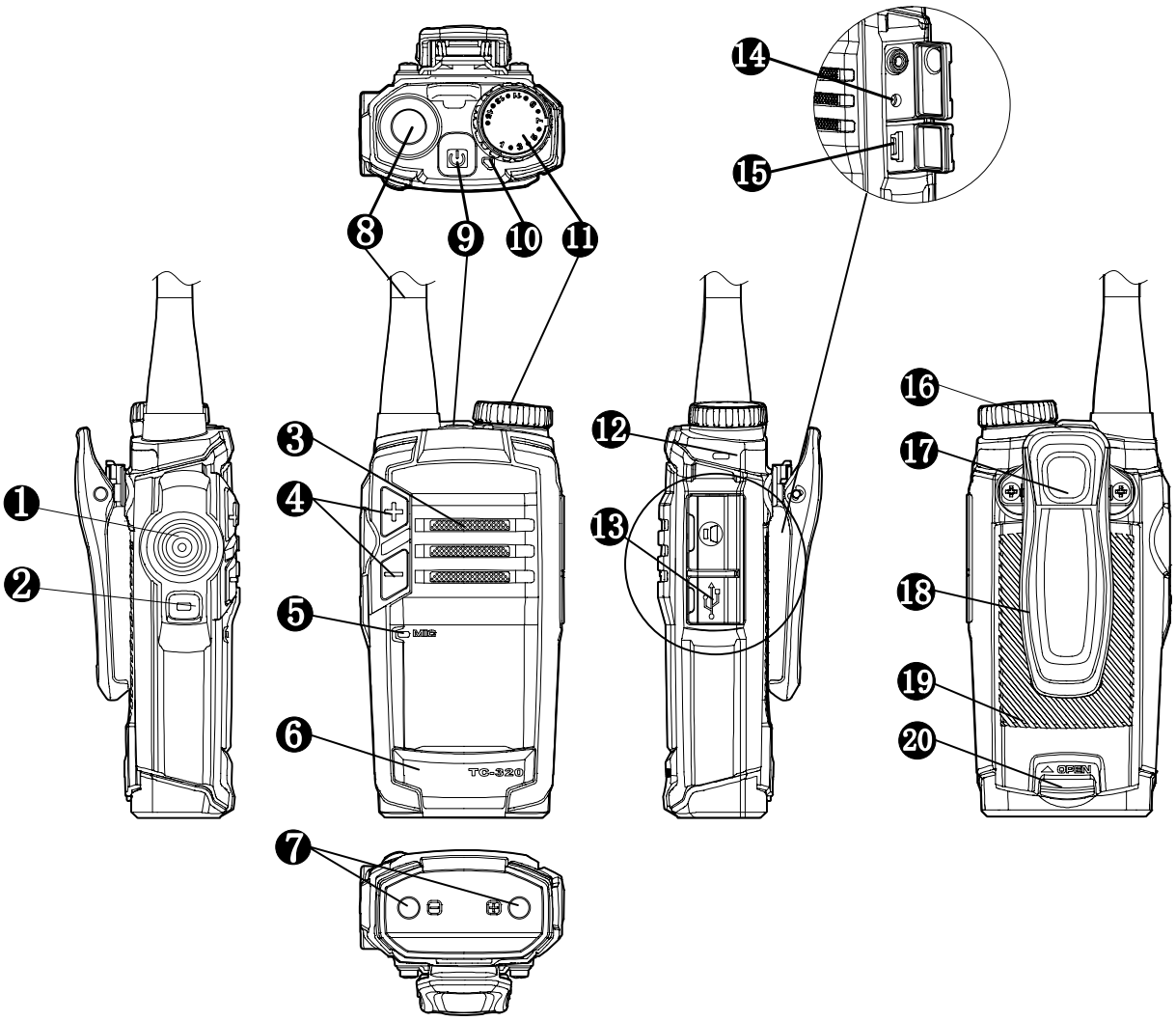
1. Introduction

Intended User

This manual is intended for use by qualified technicians only.

2. Product Controls



(1) PTT Key	(2) SK (programmable)	(3) Speaker	(4) Volume Control Key ([+]/[-])
(5) Microphone	(6) Nameplate	(7) Charging Terminal	(8) Antenna
(9) Power On/Off Key	(10) Channel/Status Indicator	(11) Channel Selector Knob	(12) Charge Indicator
(13) Accessory Jack Cover	(14) Accessory Jack	(15) MINI USB Port	(16) Strap Hole
(17) Screw for Belt Clip	(18) Belt Clip	(19) Battery Cover	(20) Battery Latch

* PTT (Push-to-Talk) Key

Hold the **PTT** key to transmit, and release it to receive.

* Programmable Function Key

The side key (SK) can be programmed with long/short press functions by your dealer. (Note: Short Press means key press shorter than 1 second, while Long Press means key press longer than 1 second.)

* Channel/Status Indicator

See the table below for LED and alert tone indications:

<table>
<tr><th colspan="2">Item</th><th>Indication</th></tr>
<tr><td rowspan="3">Wired Clone</td><td rowspan="2">To enter Wired Clone Mode</td><td>Hold down both SK and Power On/Off Key, and the source radio is turned on with Status Indicator flashing red once.</td></tr>
<tr><td>Turn on the target radio directly.</td></tr>
<tr><td>Status of the source radio (After target radio is turned on and cloning cable is connected, press PTT of the source radio to begin cloning.)</td><td>The Status Indicator glows red during cloning process.
Error occurs during cloning:
● User Clone: Once cloning begins, frequency band and Model ID will be checked. The Status Indicator glows orange for 2 seconds and then goes out to indicate a failed check. If the check is successfully carried out but error occurs during cloning, the Status Indicator will keep flashing orange until you press any key other than the Power On/Off Key to cancel it.
● Factory Clone: If error data clone occurs, the Status Indicator will flash orange. In this situation, press any key other than the Power On/Off Key to turn it off.
Once cloning is completed, the Status Indicator will solidly glow green.
The Status Indicator flashes red when it indicates low voltage, which will not be responded in the clone mode.</td></tr>
</table>

Item		Indication
	Status of the target radio in Wired Clone Mode	● The Status Indicator glows green during cloning. ● The green Status Indicator goes out once cloning is completed.
Power On (to enter User Mode)		When the radio is turned on, a power-on alert tone sounds and the Status Indicator flashes orange once. When the radio is currently on a blank channel, it will sound beep tones continuously.
Powering off		When the radio is turned on, a power-off alert tone will sound.
Low Battery Alert		The Status Indicator will flash red, and a low-pitched tone will sound every 10 seconds.
Transmitting		The Status Indicator will glow red during transmitting. ● When the TOT timer expires, the radio will sound beep tone continuously. ● A TOT pre-alert tone will sound before the TOT timer expires.
Receiving		The Status Indicator will glow green when carrier is present.
Scanning		● The Status Indicator will flash green once per second during scanning. ● Scan Start Alert (programmable by the dealer): One beep will sound. ● Scan End Alert (programmable by the dealer): One beep will sound.
Writing/Reading		● The Status Indicator glows red when the PC is reading data from the radio.

Item	Indication
	● The Status Indicator glows green when the PC is writing data into the radio.
Power Adjustment	● A low-pitched tone will sound when the radio switches from high power to low power. ● A high-pitched tone will sound when the radio switches from low power to high power.
VOX	● The alert tone sounds once when the VOX feature is activated. ● The alert tone sounds twice when the VOX feature is disabled.

* Channel Selector Knob

Rotate the knob to select your desired channel.

* Power On/Off Key

Long press the **Power On/Off Key** until an alert tone is heard to turn the radio on/off.

* Volume Control Keys [+]/[-]

You may adjust the volume level through keys [+] / [-]. Press **[+]** to increase or **[-]** to decrease the volume level. During adjustment, the radio will sound alert tones corresponding to the volume level.

* Battery Latch

Used to secure or remove the battery.

* Audio Accessory Jack

Used to connect audio accessories such as earpiece and microphone.

* Mini USB Jack

Used to connect accessories such as programming cable, cloning cable and power cord.

3. Software Specifications

Function List

- Channel Capacity: 16
- Channel Spacing: 25KHz/12.5KHz
- Channel Scan
- Rx/Tx status indication (red/green LED)
- CTCSS/CDCSS Encode&Decode (38 groups of CTCSS, 83 groups of CDCSS, and CTCSS Tail Revert of 180 degrees.)
- Low Battery Alert
- Battery Save
- Unlock Detection and Emergency Alarm
- 2 Selectable Squelch Levels
- Monitor
- Time-out Timer (TOT)
- Squelch Tail Elimination
- PC Programming (manual / automatic adjustment)
- High/Low Power Switch (2.0/0.5.0W)
- Wide & Narrow Bandwidth Compatible
- Busy Channel Lockout (transmission prohibited in busy status)
- Wired Clone
- Battery Strength Indicator
- Manual Adjustment

Description of Modes

3.1.1 User Mode

It is a conventional communication mode. The radio will enter this mode by default after power-on.

3.1.2 PC Programming Mode

The radio in User Mode enters PC Programming Mode through specific protocol based communication with the programming software. In this mode, radio functions and tuning parameters can be set through the programming software (including User Version and Factory Version).

Operations:

Step 1 Install PC programming software and its driver dedicated for TC-320 before your initial use.

Step 2 Connect the USB port of PC with the Mini USB port of the radio using a programming cable.

Step 3 Turn on the radio.

Step 4 Run the programming software to perform reading or writing operation.

Note:

- When reading/writing is in progress, the Status Indicator glows red/green; when reading/writing data is completed, the Status Indicator goes out.
- During the operation, if any abnormal situation occurs or no reply is given within a certain period, the reading/writing operation will fail and an error message window will pop up.

3.1.3 Wired Clone Mode

Description

Wired Clone mode is an independent mode. To access other modes, you must restart the radio.

Wired Clone Mode includes Clone Mode and Factory Clone Mode.

- Clone Mode

  Connect two radios using a clone cable. Hold both **SK** and **Power On/Off Key** of the source radio, it will be turned on and will enter Clone Mode after 2 seconds. The target radio can be directly turned on to enter user mode. In this mode, parameter data stored in EEPROM of the source radio will be cloned to EEPROM of the target radio. The range of data transmitted only covers channel data and common parameters, excluding tuning data, version and serial No. of the model.

- Factory Clone Mode

  Connect two radios using a clone cable. Hold both **SK** and **Power On/Off Key** of the source radio, it will be turned on and will enter Clone Mode by default after 2 seconds. Press **SK** afterwards to switch to Factory Clone Mode. The target radio can be directly turned on to enter user mode. The range of transmitted data covers all data (including settings for the Manual Tune Switch) stored in EEPROM, with exclusion of the serial No.

Process

Process of Wired Clone:

Step 1 The Status Indicator flashes red once after the source radio enters Wired Clone mode. Press **PTT** to clone data to the target radio.

Step 2 During communication, the Status Indicator of the source radio glows red, and the Status Indicator of the target radio glows green. When the communication ends, green LED of the source radio glows and the green LED of the target radio goes out, which indicates the preparation for another clone.

Step 3 If any abnormal situation occurs during communication, the source radio will flash orange Status Indicator and will stop communication for another cloning.

Step 4 When cloning ends, the source radio goes back to the standby status. Press **PTT** again to begin another cloning operation.

3.1.4 Manual Tune Mode

Hold **PTT, SK** and **Power On/Off Key** to turn the radio on and enter Manual Tune Mode.

Note:

This operation is subject to the option Tune Switch in the programming software. If this switch is set to Close, the radio can not enter this mode. It helps avoid any unexpected change of values and degradation of radio performance.

Do keep this option unchecked after values are well adjusted from the factory, to avoid any unexpected change of values. Such values can only be reset and changed in Manual Tune Mode only.

Description of Tuning:

To enter Manual Tune Mode

Hold **PTT, SK** and **Power On/Off Key** until the radio is turned on and the Status Indicator glows orange, the radio will enter Manual Tune Mode. When the key is released, the radio will enter Item N of Tx group (N depends on the position where the channel selector knob locates). The Status Indicator glows red for TX tuning items and green for RX tuning items.

To switch between TX Tuning items and RX Tuning items

This operation is done through the channel selector knob.

- The Status Indicator solidly glows red when you are adjusting items in Tx group.
- The Status Indicator solidly glows green when you are adjusting items in Rx group.

About the TX/RX tuning items

This action is carried out by applying channel selector knob as follows:

- TX group: CH1-CH9 respectively stands for TX Low Power, TX High Power, CDCSS Balance, CDCSS Deviation, CTCSS Deviation (low), CTCSS Deviation (medium), CTCSS Deviation (high), TX Low Voltage Threshold and Max. TX Audio Deviation.

The Status Indicator solidly glows red during TX group tuning (CH1 to CH9).

- RX group: CH10-CH12 respectively stands for SQL On 5, SQL Off 5, and RX Low Voltage Threshold.

  The Status Indicator solidly glows green when you are tuning items CH10-CH12.

  On CH13-CH16, no tuning item can be found and the Status Indicator goes out.

To switch between wide and narrow bands

When tuning a certain item, short press **SK** (the Status Indicator flashes orange indicating valid press) to switch between wide/narrow bandwidth. After this operation, the first frequency of current bandwidth is the frequency for adjustment by default.

To switch the frequency

Short press **PTT** (the Status Indicator flashes green indicating valid press) to switch between frequencies orderly under certain bandwidth and certain tuning item.

To tune the value

Short press **[+]** under certain bandwidth and certain tuning item, and the value will increase in steps of 1; hold **[+]**, and the value will keep increasing in steps of 1. The value will remain unchanged once it reaches the allowed maximum value.

Short press **[-]** under certain bandwidth and certain tuning item, and the value will decrease in steps of 1; hold **[-]**, and the value will keep decreasing in steps of 1. The value will remain unchanged once it reaches the allowed minimum value.

About several special items

- TX group: CH8 (TX Low Voltage Threshold) This item is related to AD sampling. Press **[+]** or **[-]** after entering the above item, to activate AD sampling (including calculation) once. Rotate the **Channel Selector Knob** to save the current AD sampling value. If neither **[+]** nor **[-]** is pressed, the value will not be updated, and AD sampling will not be activated.
- RX group: CH10-CH12 respectively stands for SQL On 5, SQL Off 5, and RX Low Voltage Threshold. These items are related to AD sampling. Press **[+]** or **[-]** after entering the above items, to activate AD sampling (including calculation) once. Rotate the **Channel Selector Knob** to save the current AD sampling value. If neither **[+]** nor **[-]** is pressed, the value will not be updated, and AD sampling will not be activated.

About the Key-press

- Short press: key-press time shorter than 1 second;
- Long press: key-press time longer than 1 second.

4. Circuit Description

4.1 General Principle Diagram

The general circuit is composed of RDA chip circuit, TX circuit, RX circuit, power supply circuit, control circuit, etc. See the block diagram below:

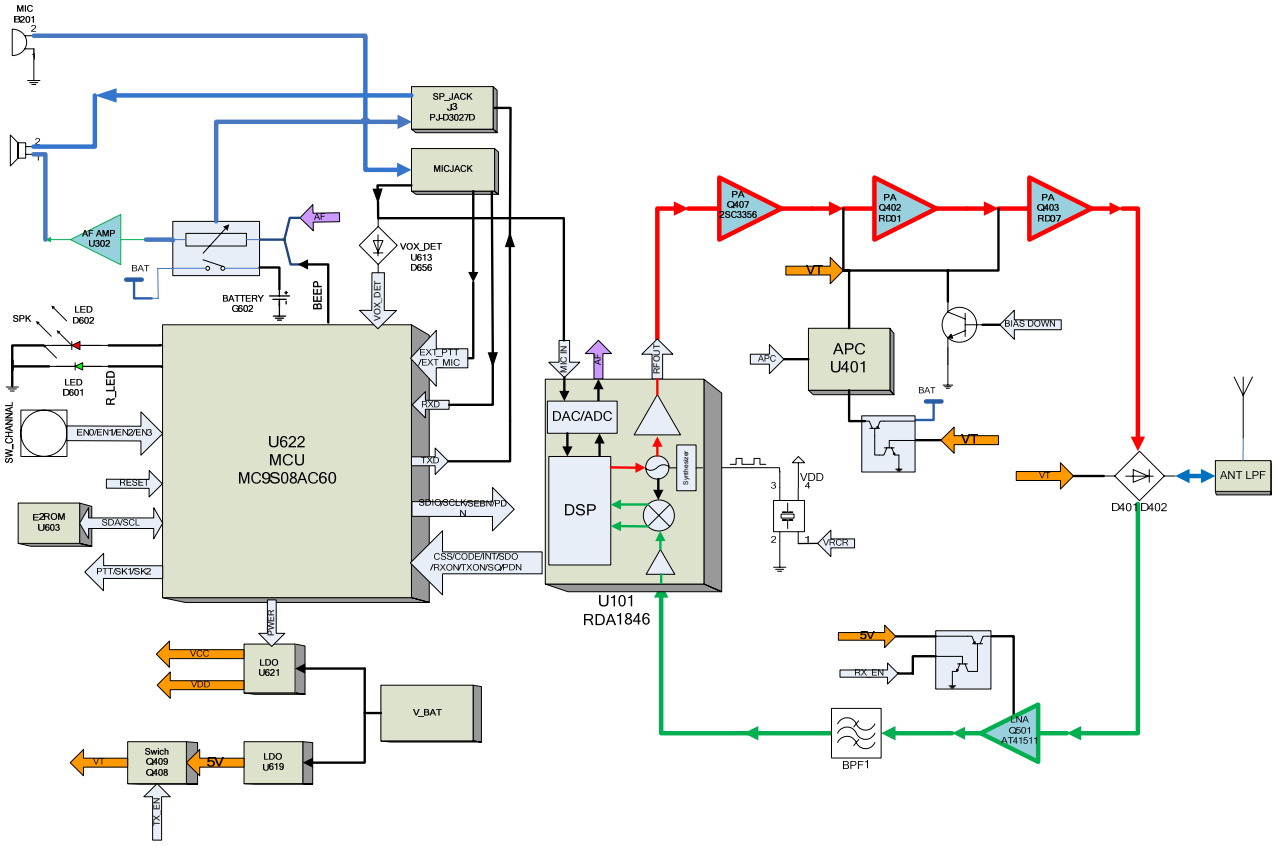


Figure 1

- RDA Chip Circuit

  This chip is highly integrated. Its function includes voice signal processing/modulation/demodulation, DSP, VCO, PLL, LNA and RF IF. The voice signal from MIC goes to RDA chip for amplification. Next, the amplified voice signal will undergo a series of processing including A/D conversion, filtering, pre-emphasizing, gain control, amplitude limit and D/A conversion. Then the analog voice signal is delivered to VCO and amplified to a signal with 8dBm. When the RX RF signal enters this chip, it would experience demodulation, filtering, de-emphasizing and gain control. Finally, the signal is output to the audio amplifier.

- TX Circuit

  The modulated RF signal from RDA chip goes to Q407 and Q402 for amplification, and then further amplified by Q403. Then the amplified signal is delivered to low-pass filter to filter out the high-order harmonics. Finally, it is sent via the antenna.

- RX Circuit

  After going through LPF and amplitude limiter, the RF signal received from the antenna enters Q501 LNA for amplification. Then the BPF will filter the signal to remove other unwanted signals. The resulting signal is delivered to RDA chip for demodulation. After that, the voice signal from demodulation is output U301 for amplification, which is finally output from the speaker.

- Power Circuit

  LDO U619 and DO U621 convert the 3.8V power supply into two 3.3V power supplies, powering VCC and VDD respectively. VCC powers CPU, while VDD powers RDA chip. Then Q409 converts the 3.3V power supply to VT to power the TX circuit.

4.2 Realization Methods of Basic Functional Modules

4.2.1 RDA Chip Circuit

This chip is highly integrated. Its function includes voice signal processing/modulation/demodulation, DSP, VCO, PLL, LNA and RF IF.

RDA Chip Circuit

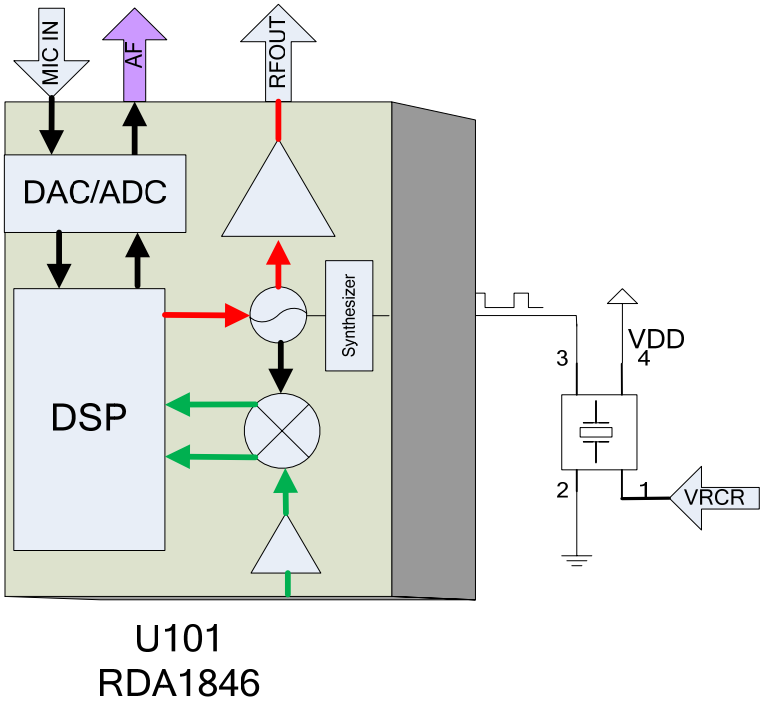
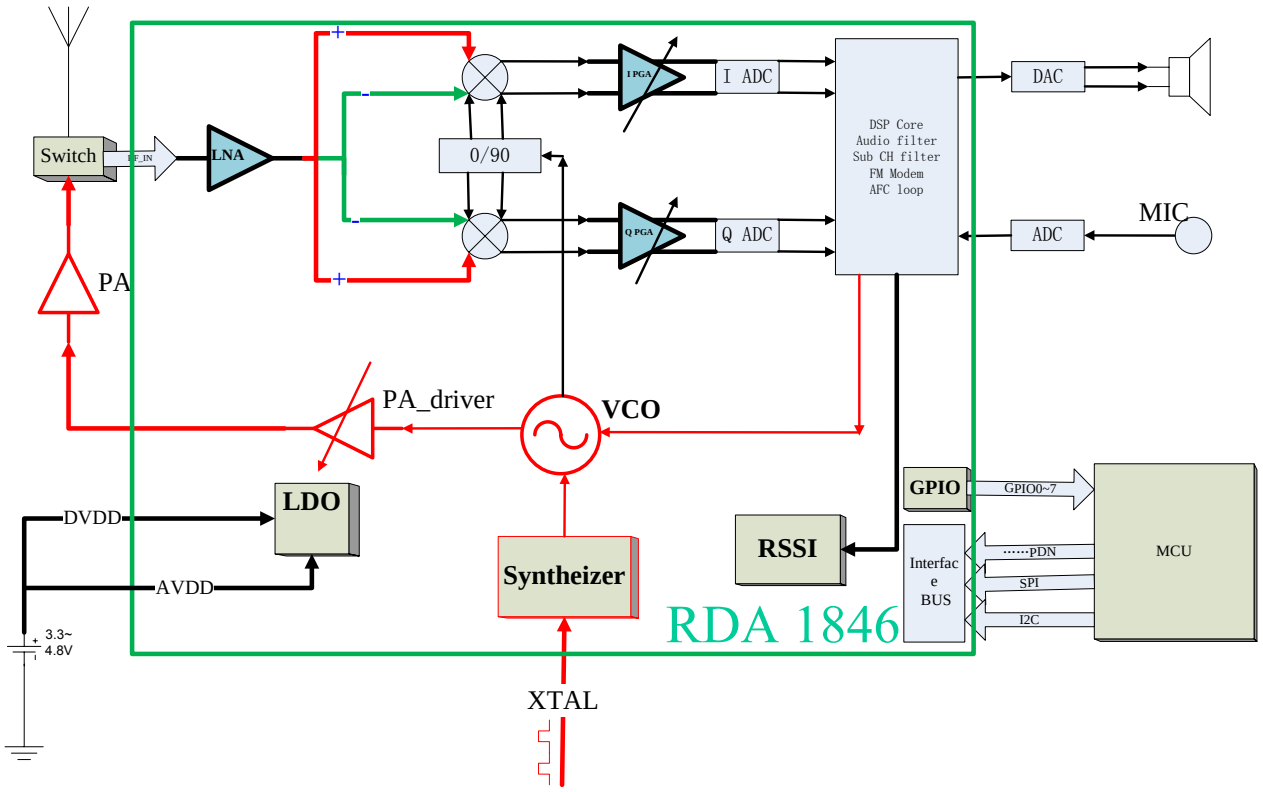


Figure 2

The reference clock signal of RDA chip is provided by 26MHZ crystal oscillator. The block diagram is given below:



After entering RDA chip via MIC, the voice signal will undergo A/D conversion to get digital signal, which will be delivered to DSP for further processing such as filtering, amplification, amplitude-limiting and pre-emphasizing. Then the resulting voice signal is modulated to the internal VCO and output after being amplified by the driver amplifier. At the RX end, the received RF signal will go to LNA for amplification first, and then go to IF demodulation circuit to get demodulated voice signal. After gain control, such signal is converted into digital signal, which will enter DSP for further processing such as filtering, amplification and de-emphasizing.

The function of RDA is subject to MCU U622 and its reference clock signal is from 26MHZ crystal oscillator. This chip is applicable to UHF (400~520MHZ) and VHF (134~174MHZ). The NF can be up to 3dB and IIP3 up to -6dBm, meeting GB and FCC requirements. Its RF output may reach up to 8dBm.

4.2.2 RF Power Amplifier Circuit (TX Section)

The block diagram of the RF power amplifier circuit is shown in the figure below:

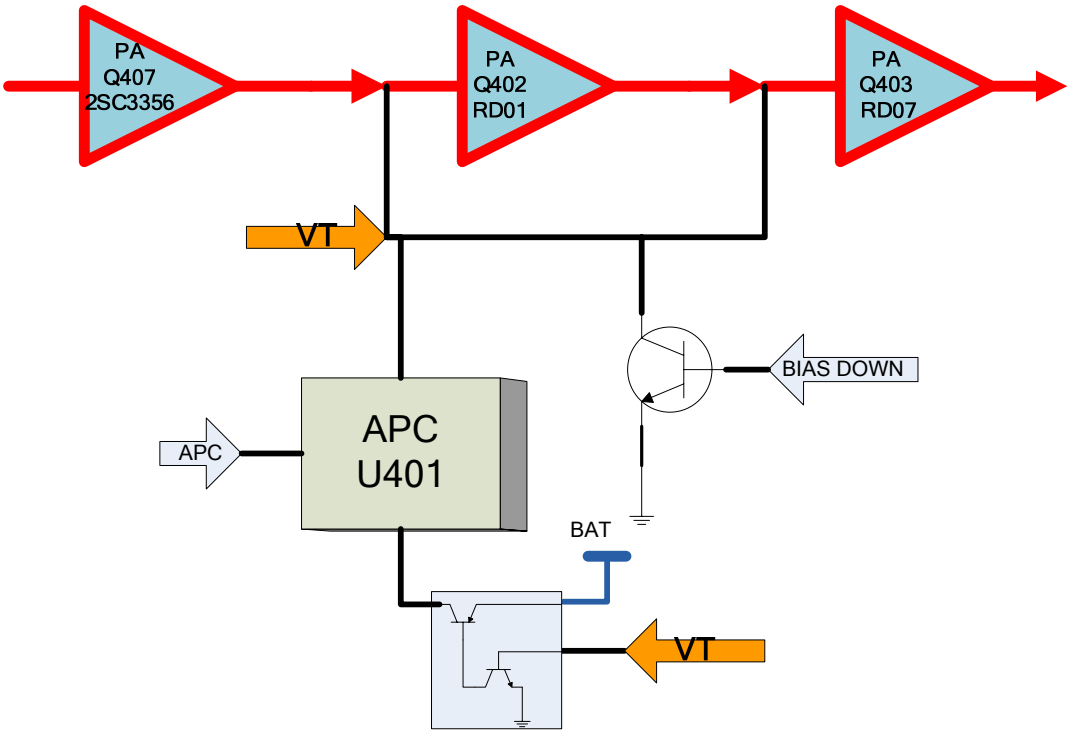


Figure 3

The modulated RF signal from RDA chip goes to Q407 and Q402 for amplification, and then further amplified by Q403. Then the amplified signal is delivered to low-pass filter to filter out the high-order harmonics. Finally, it is sent via the antenna. The control signal “VT” is used to control the operation of driver amplifier (Q407 and Q402). U401 works for auto power control (APC).

4.2.3 Receiver Circuit (RX Section)

The Block Diagram of RX Circuit is shown as below:

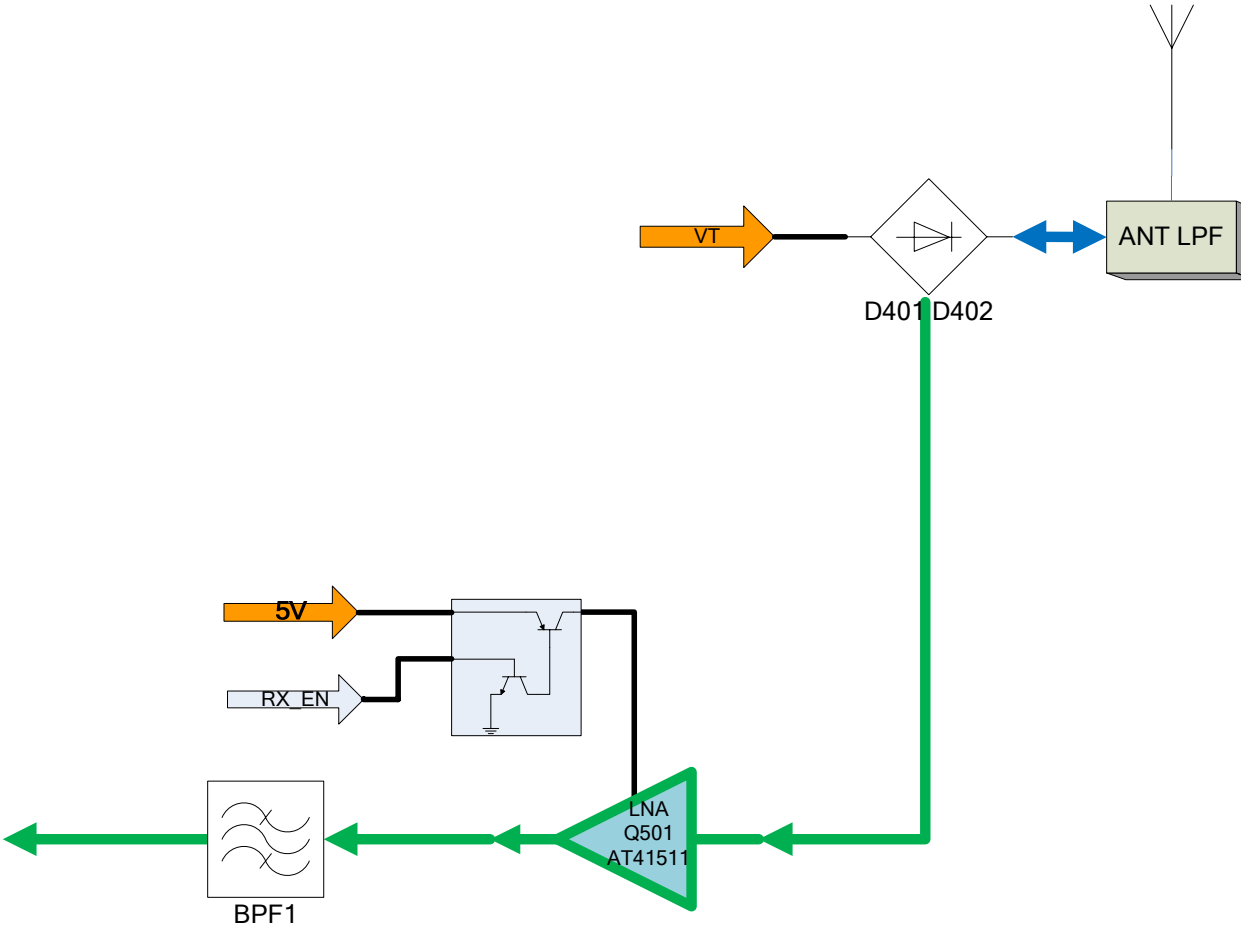


Figure 4

The RF signal is received via the antenna. After going through LPF and amplitude limiter, the signal is amplified by Q501 LNA.

Next, the BPF will remove the interference signal in amplified RF signal. Then the resulting signal goes to RDA chip for further processing. The processed signal is delivered to U302 for amplification and finally output by the speaker.

4.2.4 MCU Control, Signal Processing and Audio Amplification

Circuit diagram of this section is shown as below:

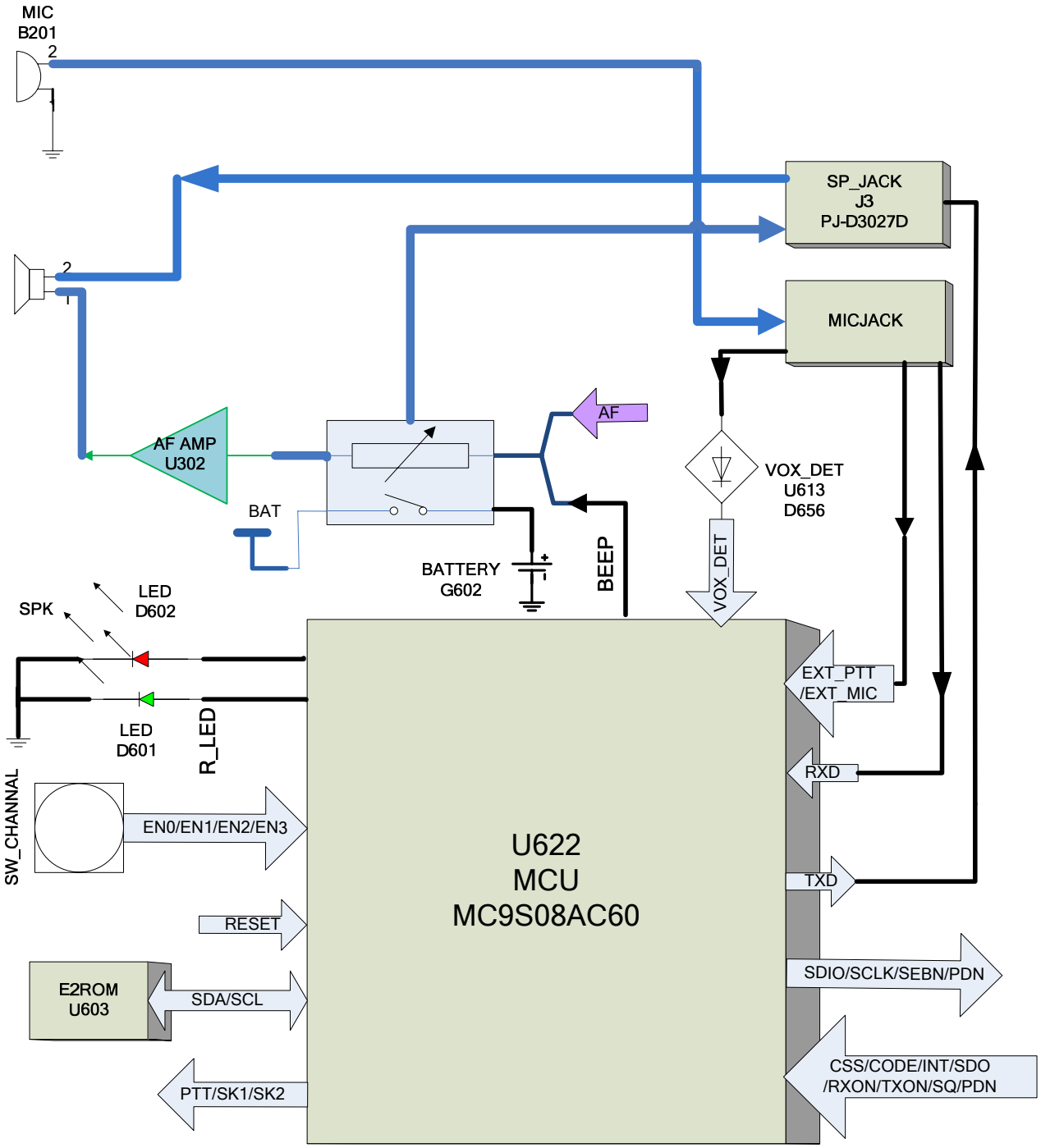


Figure5

MCU Control Circuit

MCU control circuit is composed of MCU, EEPROM, keys, etc. This section has the following functions: to initialize data of the radio and save data to EEPROM; to detect battery voltage and signals from external keys, LD and VOX, and to make response; to transmit required data to PLL based on the channel encoding status; to switch and control RX/TX based on the input PTT signal; to switch the squelch circuit on/off based on the input signaling decode signal and squelch level signal; to control circuits of high/low power switch, audio power amplifier, RDA chip power supply, RX power supply and

TX power supply; (for programming) to communicate with PC via RXD/TXD based on the RS232 protocol, and transmit/receive data to/from PC.

RDA Chip Control

By controlling the RDA chip, the MCU can realize these services: frequency setting, frequency bandwidth, reference clock, sleep mode, SQ, VOX, squelch, frequency deviation, voice filtering, signaling encoding/decoding, pre-emphasizing, gain control, amplitude limiting, de-emphasizing, etc.

Audio Amplifier

The audio signal output from U622 is amplified by the audio power amplifier (U301) to drive the speaker directly.

Power Supply Section

Block diagram of power supply circuit is shown as below:

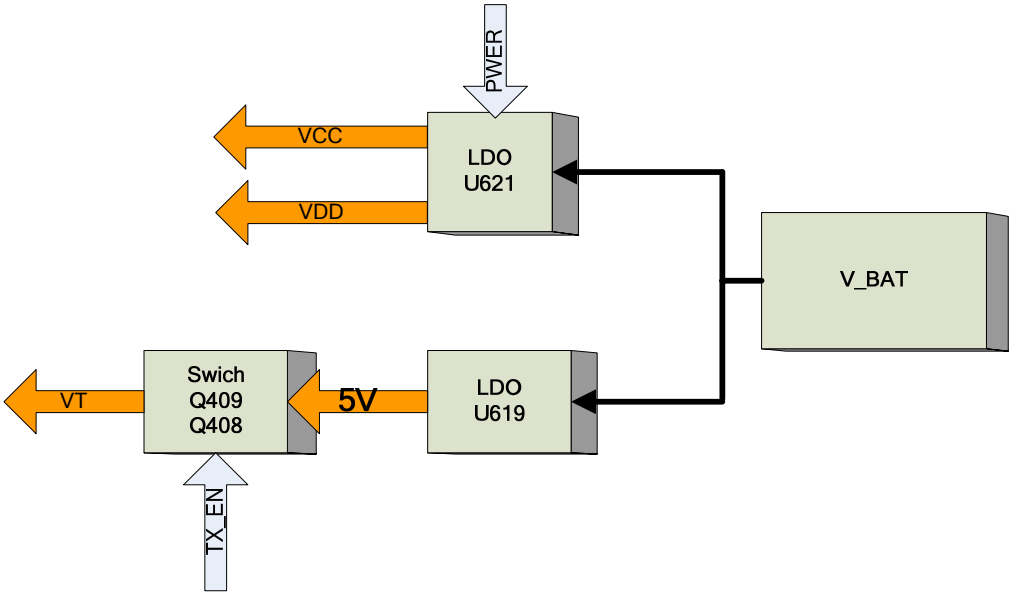


Figure 6

LDO U619 and LDO U621 convert the 3.8V power supply into two 3.3V power supplies, powering VCC and VDD respectively. VCC powers CPU, while VDD powers RDA chip. Then Q409 converts the 3.3V power supply to VT to power the TX circuit.

5. CPU Pins

PIN No.	Pin Name	Definition	I/O	Description
1	PTC4	POWER ON/OFF	I	Power Switch
2	IRQ/TPMCLK	IRQ	I	Connected to power switch for reviving MCU in power-off mode
3	RESET	RESET	I	Reset
4	PTF0/TPM1CH2	BEEP	O	Tone
5	PTF1/TPM1CH3	VRCR	O	PWM output for freq. adjustment
6	PTF2/TPM1CH4	APC	O	PWM output for PA APC
7	PTF3/TPM1CH5	CSS	I	Detection pin, CDCSS status output
8	PTF4/TPM2CH0	TXON	I	TX status detection pin
9	PTC6	PWER	O	Radio power control pin
10	PTF7	UP	I	Volume increase key
11	PTF5/TPM2CH1	RXON	I	RX status detection pin
12	PTF6	DOWN	I	Volume decrease key
13	PTE0/TxD1	UART_TXD	O	Port
14	PTE1/RxD1	UART_RXD	I	Port
15	PTE2/TPM1CH0	INT	I	Detection pin, programmable
16	PTE3/TPM1CH1	CODE	I/O	Detection pin, modulated digital signal input/output
17	PTE4/SS1	SEBN	O	SPI port of communication
18	PTE5/MISO1	SDO	I	SPI port of communication

PIN No.	Pin Name	Definition	I/O	Description
19	PTE6/MOSI1	SDIO	O	SPI port of communication
20	PTE7/SPSCK1	SCLK	O	SPI port of communication
21	VSS	VSS	/	Ground
22	VDD	VDD	/	Power Supply
23	PTG0/KBI1P0	SQ	I	Detection pin, SQ status check
24	PTG1/KBI1P1	TX_EN	O	TX power supply control
25	PTG2/KBI1P2	RX_EN	O	RX power supply control
26	PTA0	EN1	I	Rotary switch
27	PTA1	EN2	I	Rotary switch
28	PTA2	EN3	I	Rotary switch
29	PTA3	EN4	I	Rotary switch
30	PTA4	Reserved	O	Reserved
31	PTA5	Reserved	O	Reserved
32	PTA6	Reserved	O	Reserved
33	PTA7	PDN	O	Sleep control
34	PTB0/TPM3CH0/AD1P0	Reserved	O	Reserved
35	PTB1/TPM3CH1/AD1P1	Reserved	O	Reserved
36	PTB2/AD1P2	Reserved	O	Reserved
37	PTB3/AD1P3	VOX_DET	AD	VOX control
38	PTB4/AD1P4	EXT_MIC	I	External microphone
39	PTB5/AD1P5	EXT_PTT	I	External PTT
40	PTB6/AD1P6	APA_EN	O	Audio power amplifier switch

PIN No.	Pin Name	Definition	I/O	Description
41	PTB7/AD1P7	R_LED	O	Red LED
42	PTD0/AD1P8	G_LED	O	Green LED
43	PTD1/AD1P9	Reserved	O	Reserved
44	VDDAD	VDD_AD	/	Power supply for digital circuit
45	VSSAD	VSS_AD	/	Ground (digital)
46	PTD2/KBI1P5/AD1P10	SDA	I/O	External EEPROM
47	PTD3/KBI1P6/AD1P11	SCL	O	External EEPROM
48	PTG3/KBI1P3	Reserved	O	Reserved
49	PTG4/KBI1P4	Reserved	O	Reserved
50	PTD4/TPM2CLK/AD1P12	BAT_DET	AD	Battery detection
51	PTD5/AD1P13	Reserved	O	Reserved
52	PTD6/TPM1CLK/AD1P14	Reserved	O	Reserved
53	PTD7/KBI1P7/AD1P15	Reserved	O	Reserved
54	VREFH	VREFH	/	AD reference voltage
55	VREFL	VREFL	/	AD reference grounding
56	BKGD/MS	BKGD	/	Tuning communication
57	PTG5/XTAL	XTAL	/	External crystal
58	PTG6/EXTAL	EXTAL	/	External crystal
59	VSS	VSS	/	Power supply grounding
60	PTC0/SCL1	Reserved	O	Reserved
61	PTC1/SDA1	BIAS_DOWN	O	Discharge control for TX PA
62	PTC2/MCLK	SK2	I	SK2

PIN No.	Pin Name	Definition	I/O	Description
63	PTC3/TxD2	SK1	I	SK1
64	PTC5/RxD2	PTT	I	PTT

6. Parts List 1

No.	Ref No.	Print No.	Part No.	Description	Qty.
1	C102	T2G	3101051020010	Chip capacitor 1000PF K 50V X7R 0402 (RoHS)	1
2	C103	T2G	3101051000020	Chip capacitor 10PF J 50V C0G 0402 (RoHS)	1
3	C104	T2G	3101051000020	Chip capacitor 10PF J 50V C0G 0402 (RoHS)	1
4	C105	T3F	3101051020010	Chip capacitor 1000PF K 50V X7R 0402 (RoHS)	1
5	C106	B3F	3101051040060	Chip capacitor 0.1UF K 16V X7R 0402 (RoHS)	1
6	C107	B3F	3101051020010	Chip capacitor 1000PF K 50V X7R 0402 (RoHS)	1
7	C108	B3F	3101051040060	Chip capacitor 0.1UF K 16V X7R 0402 (RoHS)	1
8	C109	T3F	3101051020010	Chip capacitor 1000PF K 50V X7R 0402 (RoHS)	1
9	C110	T3F	3101051040060	Chip capacitor 0.1UF K 16V X7R 0402 (RoHS)	1
10	C111	T3F	3101051020010	Chip capacitor 1000PF K 50V X7R 0402 (RoHS)	1
11	C112	T3F	3101051040060	Chip capacitor 0.1UF K 16V X7R 0402 (RoHS)	1
12	C113	B4F	3101051020010	Chip capacitor 1000PF K 50V X7R 0402 (RoHS)	1
13	C114	B4F	3101051040060	Chip capacitor 0.1UF K 16V X7R 0402 (RoHS)	1
14	C115	B4F	3101051020010	Chip capacitor 1000PF K 50V X7R 0402 (RoHS)	1
15	C116	B4F	3101051040060	Chip capacitor 0.1UF K 16V X7R 0402 (RoHS)	1
16	C117	B3G	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
17	C118	B3G	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
18	C119	B3G	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
19	C120	T2G	3101051020010	Chip capacitor 1000PF K 50V X7R 0402 (RoHS)	1
20	C121	B3G	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
21	C122	B3G	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
22	C123	T2G	3101051040060	Chip capacitor 0.1UF K 16V X7R 0402 (RoHS)	1
23	C124	B3F	3101062250000	Chip capacitor 2.2UF K 10V X5R 0603 (RoHS)	1
24	C125	T3F	3101061050000	Chip capacitor 1UF Z 25V Y5V 0603 (RoHS)	1
25	C126	T3G	3101051020010	Chip capacitor 1000PF K 50V X7R 0402 (RoHS)	1
26	C127	T3F	3101071060010	Chip capacitor 10UF K 10V X5R 0805 (RoHS)	1
27	C128	B3G	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
28	C129	B3G	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
29	C130	B2H	3101051040060	Chip capacitor 0.1UF K 16V X7R 0402 (RoHS)	1
30	C131	B4G	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
31	C132	T3F	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
32	C133	T3F	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
33	C134	B3F	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
34	C137	B3F	3101051010030	Chip capacitor 100PF J 50V C0G 0402 (RoHS)	1
35	C138	B3E	3101051010030	Chip capacitor 100PF J 50V C0G 0402 (RoHS)	1
36	C140	T4F	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
37	C141	T4E	3101061050000	Chip capacitor 1UF Z 25V Y5V 0603 (RoHS)	1
38	C201	T2F	3104074750070	Tantalum capacitor 4.7UF M 10V P (RoHS)	1
39	C202	T2E	3101051010030	Chip capacitor 100PF J 50V C0G 0402 (RoHS)	1
40	C203	T2F	3101051010030	Chip capacitor 100PF J 50V C0G 0402 (RoHS)	1
41	C209	T2F	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1

No.	Ref No.	Print No.	Part No.	Description	Qty.
42	C216	T2F	3101051020010	Chip capacitor 1000PF K 50V X7R 0402 (RoHS)	1
43	C217	T2E	3101051040060	Chip capacitor 0.1UF K 16V X7R 0402 (RoHS)	1
44	C218	T2E	3101051050000	Chip capacitor 1UF K 6.3V X5R 0402 (RoHS)	1
45	C219	T2F	3101051020010	Chip capacitor 1000PF K 50V X7R 0402 (RoHS)	1
46	C220	T2F	3101051040060	Chip capacitor 0.1UF K 16V X7R 0402 (RoHS)	1
47	C302	T3E	3101061540000	Chip capacitor 0.15UF K 25V X7R 0603 (RoHS)	1
48	C303	T3E	3101051020010	Chip capacitor 1000PF K 50V X7R 0402 (RoHS)	1
49	C304	T4E	3101051040060	Chip capacitor 0.1UF K 16V X7R 0402 (RoHS)	1
50	C305	T4E	3104074750070	Tantalum capacitor 4.7UF M 10V P (RoHS)	1
51	C306	T3E	3101064740000	Chip capacitor 0.47UF K 25V X7R 0603 (RoHS)	1
52	C307	T4H	3101051020010	Chip capacitor 1000PF K 50V X7R 0402 (RoHS)	1
53	C311	T4E	3101051040060	Chip capacitor 0.1UF K 16V X7R 0402 (RoHS)	1
54	C312	T3E	3101051040060	Chip capacitor 0.1UF K 16V X7R 0402 (RoHS)	1
55	C313	T4E	3101051040060	Chip capacitor 0.1UF K 16V X7R 0402 (RoHS)	1
56	C314	B4G	3101051010030	Chip capacitor 100PF J 50V C0G 0402 (RoHS)	1
57	C315	B3I	3101051010030	Chip capacitor 100PF J 50V C0G 0402 (RoHS)	1
58	C404	B3E	3101050600010	Chip capacitor 6PF B 50V COG 0402 (RoHS)	1
59	C406	B3E	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
60	C407	T3E	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
61	C408	B4E	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
62	C409	B3E	3101051800010	Chip capacitor 18PF J 50V C0G 0402 (RoHS)	1
63	C410	B3E	3101051500020	Chip capacitor 15PF J 50V COG 0402 (RoHS)	1
64	C412	B3E	3101053340000	Chip capacitor 0.33UF K 6.3V X5R 0402 (RoHS)	1
65	C413	B4D	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
66	C414	B3D	3101051500020	Chip capacitor 15PF J 50V COG 0402 (RoHS)	1
67	C415	B3D	3101051800010	Chip capacitor 18PF J 50V C0G 0402 (RoHS)	1
68	C416	B3D	3101061010010	Chip capacitor 100PF J 50V C0G 0603 (RoHS)	1
69	C417	B3D	3101051040060	Chip capacitor 0.1UF K 16V X7R 0402 (RoHS)	1
70	C418	B3C	3101064700000	Chip capacitor 47PF J 50V C0G 0603 (RoHS)	1
71	C419	B3C	3101061200000	Chip capacitor 12PF J 50V C0G 0603 (RoHS)	1
72	C420	T2D	3104071040010	Tantalum capacitor 0.1UF M 20V P (RoHS)	1
73	C422	T3A	3101051040060	Chip capacitor 0.1UF K 16V X7R 0402 (RoHS)	1
74	C424	B3D	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
75	C425	B3B	3101061010010	Chip capacitor 100PF J 50V C0G 0603 (RoHS)	1
76	C426	T3B	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
77	C427	B3B	3101061010010	Chip capacitor 100PF J 50V C0G 0603 (RoHS)	1
78	C428	B3A	3101050200010	Chip capacitor 2PF B 50V C0G 0402 (RoHS)	1
79	C429	B3A	3101050200010	Chip capacitor 2PF B 50V C0G 0402 (RoHS)	1
80	C430	B3A	3101050300000	Chip capacitor 3PF B 50V COG 0402 (RoHS)	1
81	C431	B3A	3101050200010	Chip capacitor 2PF B 50V C0G 0402 (RoHS)	1
82	C432	B3A	3101054790040	Chip capacitor 4.7PF B 50V COG HQ 0402 (RoHS)	1
83	C435	B3C	3101061200000	Chip capacitor 12PF J 50V C0G 0603 (RoHS)	1
84	C436	B2C	3101051040060	Chip capacitor 0.1UF K 16V X7R 0402 (RoHS)	1
85	C437	B2C	3101051030020	Chip capacitor 0.01UF K 25V X7R 0402 (RoHS)	1

No.	Ref No.	Print No.	Part No.	Description	Qty.
86	C439	B3D	3101051200020	Chip capacitor 12PF J 50V COG 0402 (RoHS)	1
87	C440	B2C	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
88	C441	T3B	3101051040060	Chip capacitor 0.1UF K 16V X7R 0402 (RoHS)	1
89	C442	T3B	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
90	C443	T2B	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
91	C444	T2B	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
92	C445	T3B	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
93	C446	T3A	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
94	C447	T3A	3101051020010	Chip capacitor 1000PF K 50V X7R 0402 (RoHS)	1
95	C449	B3B	3101064790010	Chip capacitor 4.7PF B 50V COG 0603 (RoHS)	1
96	C450	B3B	3101060200010	Chip capacitor 2PF B 50V C0G 0603 (RoHS)	1
97	C451	B3C	3101062200010	Chip capacitor 22PF J 50V COG 0603 (RoHS)	1
98	C452	T2B	3104081060120	Tantalum capacitor 10UF M 16V S (RoHS)	1
99	C453	T2B	3101051040060	Chip capacitor 0.1UF K 16V X7R 0402 (RoHS)	1
100	C454	T3A	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
101	C455	B4E	3101051040060	Chip capacitor 0.1UF K 16V X7R 0402 (RoHS)	1
102	C456	B4E	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
103	C457	T2B	3101051030020	Chip capacitor 0.01UF K 25V X7R 0402 (RoHS)	1
104	C458	B4E	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
105	C464	T3A	3101051040060	Chip capacitor 0.1UF K 16V X7R 0402 (RoHS)	1
106	C501	B2B	3101050200010	Chip capacitor 2PF B 50V C0G 0402 (RoHS)	1
107	C502	B2B	3101050200010	Chip capacitor 2PF B 50V C0G 0402 (RoHS)	1
108	C513	B2D	3101054700010	Chip capacitor 47PF J 50V COG 0402 (RoHS)	1
109	C514	B2E	3101051020010	Chip capacitor 1000PF K 50V X7R 0402 (RoHS)	1
110	C515	B3E	3101050200010	Chip capacitor 2PF B 50V C0G 0402 (RoHS)	1
111	C517	B3E	3101050500010	Chip capacitor 5PF B 50V COG 0402 (RoHS)	1
112	C519	B2B	3101051020010	Chip capacitor 1000PF K 50V X7R 0402 (RoHS)	1
113	C520	B3E	3101050500010	Chip capacitor 5PF B 50V COG 0402 (RoHS)	1
114	C521	B2E	3101051040060	Chip capacitor 0.1UF K 16V X7R 0402 (RoHS)	1
115	C522	B3E	3101054790040	Chip capacitor 4.7PF B 50V COG HQ 0402 (RoHS)	1
116	C523	B3E	3101054790040	Chip capacitor 4.7PF B 50V COG HQ 0402 (RoHS)	1
117	C524	B2E	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
118	C525	B2E	3101051020010	Chip capacitor 1000PF K 50V X7R 0402 (RoHS)	1
119	C526	B3E	3101052790060	Chip capacitor 2.7PF B 50V COG HQ 0402 (RoHS)	1
120	C527	B2E	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
121	C528	B2E	3101051020010	Chip capacitor 1000PF K 50V X7R 0402 (RoHS)	1
122	C563	B2E	3101051020010	Chip capacitor 1000PF K 50V X7R 0402 (RoHS)	1
123	C605	B4I	3101051020010	Chip capacitor 1000PF K 50V X7R 0402 (RoHS)	1
124	C606	B4F	3101051040060	Chip capacitor 0.1UF K 16V X7R 0402 (RoHS)	1
125	C607	T4C	3104074750070	Tantalum capacitor 4.7UF M 10V P (RoHS)	1
126	C609	B5F	3101062250000	Chip capacitor 2.2UF K 10V X5R 0603 (RoHS)	1
127	C611	T5E	3104081060120	Tantalum capacitor 10UF M 16V S (RoHS)	1
128	C612	B5F	3101051030020	Chip capacitor 0.01UF K 25V X7R 0402 (RoHS)	1
129	C613	B4F	3101051020010	Chip capacitor 1000PF K 50V X7R 0402 (RoHS)	1

No.	Ref No.	Print No.	Part No.	Description	Qty.
130	C615	B4G	3101051030020	Chip capacitor 0.01UF K 25V X7R 0402 (RoHS)	1
131	C621	T5E	3101062250000	Chip capacitor 2.2UF K 10V X5R 0603 (RoHS)	1
132	C622	B4H	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
133	C623	B4H	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
134	C624	B4H	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
135	C625	B4H	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
136	C626	B4H	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
137	C627	T2I	3101051040060	Chip capacitor 0.1UF K 16V X7R 0402 (RoHS)	1
138	C628	B4H	3101051050000	Chip capacitor 1UF K 6.3V X5R 0402 (RoHS)	1
139	C629	B4H	3101051040060	Chip capacitor 0.1UF K 16V X7R 0402 (RoHS)	1
140	C630	B2I	3101051030020	Chip capacitor 0.01UF K 25V X7R 0402 (RoHS)	1
141	C631	B5F	3101062250000	Chip capacitor 2.2UF K 10V X5R 0603 (RoHS)	1
142	C632	B2I	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
143	C633	B1E	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
144	C634	T3A	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
145	C635	B3I	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
146	C636	B2H	3101051040060	Chip capacitor 0.1UF K 16V X7R 0402 (RoHS)	1
147	C637	B2I	3101051040060	Chip capacitor 0.1UF K 16V X7R 0402 (RoHS)	1
148	C638	T3H	3101052200010	Chip capacitor 22PF J 50V C0G 0402 (RoHS)	1
149	C639	T3H	3101052200010	Chip capacitor 22PF J 50V C0G 0402 (RoHS)	1
150	C640	B4G	3101051020010	Chip capacitor 1000PF K 50V X7R 0402 (RoHS)	1
151	C641	B3G	3104074750070	Tantalum capacitor 4.7UF M 10V P (RoHS)	1
152	C642	B3H	3101051040060	Chip capacitor 0.1UF K 16V X7R 0402 (RoHS)	1
153	C643	B5G	3101062250000	Chip capacitor 2.2UF K 10V X5R 0603 (RoHS)	1
154	C644	T5D	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
155	C645	B1B	3101052230000	Chip capacitor 0.022UF K 16V X7R 0402 (RoHS)	1
156	C646	B1C	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
157	C647	T4B	3101051020010	Chip capacitor 1000PF K 50V X7R 0402 (RoHS)	1
158	C648	B1B	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
159	C649	B5E	3101051030020	Chip capacitor 0.01UF K 25V X7R 0402 (RoHS)	1
160	C650	B2H	3101051040060	Chip capacitor 0.1UF K 16V X7R 0402 (RoHS)	1
161	C651	B3I	3101051040060	Chip capacitor 0.1UF K 16V X7R 0402 (RoHS)	1
162	C652	T4B	3104074750070	Tantalum capacitor 4.7UF M 10V P (RoHS)	1
163	C653	T4C	3101051020010	Chip capacitor 1000PF K 50V X7R 0402 (RoHS)	1
164	C654	B4E	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
165	C655	T2I	3101051040060	Chip capacitor 0.1UF K 16V X7R 0402 (RoHS)	1
166	C656	B4F	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
167	C657	B2I	3101054720000	Chip capacitor 4700PF K 50V X7R 0402(RoHS)	1
168	C658	T4B	3101064710000	Chip capacitor 470PF K 50V X7R 0603 (RoHS)	1
169	C659	T4A	3101064710000	Chip capacitor 470PF K 50V X7R 0603 (RoHS)	1
170	C660	B5B	3101064710000	Chip capacitor 470PF K 50V X7R 0603 (RoHS)	1
171	C661	T4A	3101064710000	Chip capacitor 470PF K 50V X7R 0603 (RoHS)	1
172	C662	B2H	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
173	C663	B2H	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1

No.	Ref No.	Print No.	Part No.	Description	Qty.
174	C664	B5F	3101051030020	Chip capacitor 0.01UF K 25V X7R 0402 (RoHS)	1
175	C665	B3H	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
176	C666	B2H	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
177	C667	B3H	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
178	C668	T4G	3101062250000	Chip capacitor 2.2UF K 10V X5R 0603 (RoHS)	1
179	C669	T4H	3101052200010	Chip capacitor 22PF J 50V C0G 0402 (RoHS)	1
180	C670	T4H	3101051020010	Chip capacitor 1000PF K 50V X7R 0402 (RoHS)	1
181	C671	T4H	3101051040060	Chip capacitor 0.1UF K 16V X7R 0402 (RoHS)	1
182	C672	T4G	3101051040060	Chip capacitor 0.1UF K 16V X7R 0402 (RoHS)	1
183	C673	T4A	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
184	C674	T4A	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
185	C675	T4H	3101051050000	Chip capacitor 1UF K 6.3V X5R 0402 (RoHS)	1
186	C676	T4H	3101051040060	Chip capacitor 0.1UF K 16V X7R 0402 (RoHS)	1
187	C677	B3H	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
188	C678	B3H	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
189	C679	B3H	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
190	C680	B3H	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
191	C681	B2H	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
192	C682	B2H	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
193	C683	B2H	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
194	C684	B2I	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
195	C685	B2H	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
196	C686	B3I	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
197	C687	B4H	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
198	C688	B4G	3101056800000	Chip capacitor 68PF J 50V COG 0402 (RoHS)	1
199	C689	B2H	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
200	C690	B2I	3101051020010	Chip capacitor 1000PF K 50V X7R 0402 (RoHS)	1
201	C691	T4H	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
202	C692	T4F	3101054710010	Chip capacitor 470PF K 50V X7R 0402 (RoHS)	1
203	C693	B3I	3101051040060	Chip capacitor 0.1UF K 16V X7R 0402 (RoHS)	1
204	D202	T4I	3399990000080	Zener diode 6.8V SOD-523 (RoHS)	1
205	D301	T3E	3399990000080	Zener diode 6.8V SOD-523 (RoHS)	1
206	D302	T4E	3399990000080	Zener diode 6.8V SOD-523 (RoHS)	1
207	D401	B2B	3305180300000	Varistor diode 100mA max 1Ω SOD-323 (RoHS)	1
208	D403	B3D	3310990000160	ESD protection diode 10 5A/ 8/20uS 0603 (RoHS)	1
209	D502	B2B	3303990000060	Switching diode 35V 100mA 1V SOD-523 (RoHS)	1
210	D503	B2B	3303990000060	Switching diode 35V 100mA 1V SOD-523 (RoHS)	1
211	D505	B1B	3399990000260	Rectifier diode 10V 15mA 380mV/1mA MPAK (RoHS)	1
212	D601	T4A	3307110100130	LED green 40mcd 30mA 2.1V 0603 (RoHS)	1
213	D602	T4A	3307110100060	LED red 200mcd 30mA 1.9V 1.6X0.8mm (RoHS)	1
214	D603	B5A	3307110100130	LED green 40mcd 30mA 2.1V 0603 (RoHS)	1
215	D604	B5A	3307110100060	LED red 200mcd 30mA 1.9V 1.6X0.8mm (RoHS)	1
216	D605	T4A	3310990000160	ESD protection diode 10 5A/ 8/20uS 0603 (RoHS)	1
217	D613	B5B	3310990000160	ESD protection diode 10 5A/ 8/20uS 0603 (RoHS)	1

No.	Ref No.	Print No.	Part No.	Description	Qty.
218	D614	T4B	3310990000160	ESD protection diode 10 5A/ 8/20uS 0603 (RoHS)	1
219	D615	T4A	3310990000160	ESD protection diode 10 5A/ 8/20uS 0603 (RoHS)	1
220	D656	T4H	3303030300000	Schottky diode 40V 30mA 0.26V/1mA SOT-323 (RoHS)	1
221	D657	B4C	3310990000160	ESD protection diode 10 5A/ 8/20uS 0603 (RoHS)	1
222	D662	T3F	3310990000160	ESD protection diode 10 5A/ 8/20uS 0603 (RoHS)	1
223	D663	T4F	3310990000160	ESD protection diode 10 5A/ 8/20uS 0603 (RoHS)	1
224	D664	T4E	3310990000160	ESD protection diode 10 5A/ 8/20uS 0603 (RoHS)	1
225	DOWN	T1D	4301080000090	Momentary contact 12VDC 0.05A TC-320 SMD (RoHS)	1
226	J201	B4D	5205005000100	USB connector 5Pin 0.5mm female SMD 9.9*9.2*4.0mm (RoHS)	1
227	J202	B4C	5205006000010	Bracket for earpiece jack (RoHS)	1
228	L102	B3E	3001060000000	Chip resistor 0Ω J 1/10W 0603 (RoHS)	1
229	L107	T2G	3221506601000	Ferrite bead 600Ω 100MHz ±25% 500mA 0603 (RoHS)	1
230	L108	T4F	3221506601000	Ferrite bead 600Ω 100MHz ±25% 500mA 0603 (RoHS)	1
231	L110	T2G	3213306102000	Multi-layer chip inductor 1uH K 25mA 0.6Ω Q:35 0603 (RoHS)	1
232	L111	B4F	3221506601000	Ferrite bead 600Ω 100MHz ±25% 500mA 0603 (RoHS)	1
233	L112	T3F	3221506601000	Ferrite bead 600Ω 100MHz ±25% 500mA 0603 (RoHS)	1
234	L402	B4E	3221506601000	Ferrite bead 600Ω 100MHz ±25% 500mA 0603 (RoHS)	1
235	L406	B4D	3213212102000	Wire-wound chip inductor 1uH J 245mA 1.1Ω Q:30 1008 (RoHS)	1
236	L407	B3D	3221507221000	Ferrite bead 220Ω 100MHz ±25% 2000mA 0805 (RoHS)	1
237	L408	B3D	3210306229000	Multi-layer chip inductor 2.2nH S 500mA 0.10ohm Q:12 0603 (RoHS)	1
238	L409	B2C	3231351680000	Air-core inductor E2-0.35*1.6*8TR (RoHS)	1
239	L410	B2C	3221507221000	Ferrite bead 220Ω 100MHz ±25% 2000mA 0805 (RoHS)	1
240	L411	T3B	3210107221000	Wire-wound chip inductor 220nH J 240mA 0.70ohm Q:35 0805 (RoHS)	1
241	L412	B3A	3231351630000	Air-core inductor E2-0.35*1.6*3TR (RoHS)	1
242	L413	B3A	3231351630000	Air-core inductor E2-0.35*1.6*3TR (RoHS)	1
243	L414	B3A	3231351640000	Air-core inductor E2-0.35*1.6*4TL (RoHS)	1
244	L417	B3D	3210306229000	Multi-layer chip inductor 2.2nH S 500mA 0.10ohm Q:12 0603 (RoHS)	1
245	L418	B4E	3210305150010	Multi-layer chip inductor 15nH J 300mA 0.32ohm Q:8 0402 (RoHS)	1
246	L419	B3B	3231301030000	Air-core inductor E2 0.3*1.0*3TL (RoHS)	1
247	L420	B3E	3210305120000	Multi-layer chip inductor 12nH J 300mA 0.28ohm Q:8 0402 (RoHS)	1
248	L501	B2B	3231351640000	Air-core inductor E2-0.35*1.6*4TL (RoHS)	1
249	L506	B2E	3210306101000	Multi-layer chip inductor 100nH J 300mA 0.90ohm Q:12 0603 (RoHS)	1
250	L508	B2D	3210306470000	Multi-layer chip inductor 47nH J 300mA 0.70ohm Q:12 0603 (RoHS)	1
251	L509	B2E	3212106120000	Multi-layer chip inductor 12nH J 300mA 0.28ohm Q:12 0603 (RoHS)	1
252	L510	B3E	3212106120000	Multi-layer chip inductor 12nH J 300mA 0.28ohm Q:12 0603 (RoHS)	1
253	L527	B2E	3221506601000	Ferrite bead 600Ω 100MHz ±25% 500mA 0603 (RoHS)	1
254	L603	B4H	3221506601000	Ferrite bead 600Ω 100MHz ±25% 500mA 0603 (RoHS)	1
255	L604	B3G	3221506601000	Ferrite bead 600Ω 100MHz ±25% 500mA 0603 (RoHS)	1
256	L608	T5E	3221507221000	Ferrite bead 220Ω 100MHz ±25% 2000mA 0805 (RoHS)	1

No.	Ref No.	Print No.	Part No.	Description	Qty.
257	Q103	T4F	3503010000010	P-MOSFET VDS:-30V ID:-100mA VGS(th):-1.9V SC-75 (RoHS)	1
258	Q104	T4F	3503020000030	N-MOSFET VDS:30V ID:100mA VGS(th):3.0V SC-75 (RoHS)	1
259	Q201	T2F	3411001000000	PNP TRANSISTOR 50V 150mA 70~700 SOT-523 (RoHS)	1
260	Q202	T2E	3503020000030	N-MOSFET VDS:30V ID:100mA VGS(th):3.0V SC-75 (RoHS)	1
261	Q402	B3D	3502010000130	N-MOSFET VDS:10V ID:500mA VGS(th):0.7V SC-62 (RoHS)	1
262	Q403	B3C	3504990000040	PA MOSFET 10uA 25V 10uA 7.2V 7W SMD (RoHS)	1
263	Q404	T3A	3403999000000	Transistor PNP+NPN -50V/50V(RoHS)	1
264	Q406	T3D	3403008000010	BRT Vce:50V Vloff:0.5V Vlon:3V 100mA EMT3 (RoHS)	1
265	Q407	B3E	3408002000000	NPN TRANSISTOR 12V 100mA 120 1GHz SMD (RoHS)	1
266	Q408	B4E	3403008000010	BRT Vce:50V Vloff:0.5V Vlon:3V 100mA EMT3 (RoHS)	1
267	Q409	B4E	3503010000010	P-MOSFET VDS:-30V ID:-100mA VGS(th):-1.9V SC-75 (RoHS)	1
268	Q501	B2D	3408002000000	NPN TRANSISTOR 12V 100mA 120 1GHz SMD (RoHS)	1
269	Q502	B2E	3403999000000	Transistor PNP+NPN -50V/50V (RoHS)	1
270	Q605	T4A	3403009000010	Transistor NPN*2 50V -100mA 250 SC-88A (RoHS)	1
271	R101	T2G	3001050000000	Chip resistor 0Ω J 1/16W 0402 (RoHS)	1
272	R125	B2H	3001054720000	Chip resistor 4.7KΩ J 1/16W 0402 (RoHS)	1
273	R126	B3F	3001050000000	Chip resistor 0Ω J 1/16W 0402 (RoHS)	1
274	R127	B3F	3001051020000	Chip resistor 1KΩ F 1/16W 0402 (RoHS)	1
275	R129	T3G	3001054730000	Chip resistor 47KΩ J 1/16W 0402 (RoHS)	1
276	R130	T3G	3001054730000	Chip resistor 47KΩ J 1/16W 0402 (RoHS)	1
277	R131	T3G	3001051010000	Chip resistor 100Ω J 1/16W 0402 (RoHS)	1
278	R132	T3G	3001051010000	Chip resistor 100Ω J 1/16W 0402 (RoHS)	1
279	R133	B3G	3001051010000	Chip resistor 100Ω J 1/16W 0402 (RoHS)	1
280	R134	B3G	3001051010000	Chip resistor 100Ω J 1/16W 0402 (RoHS)	1
281	R135	B3G	3001051010000	Chip resistor 100Ω J 1/16W 0402 (RoHS)	1
282	R136	B3G	3001051010000	Chip resistor 100Ω J 1/16W 0402 (RoHS)	1
283	R137	B3G	3001051010000	Chip resistor 100Ω J 1/16W 0402 (RoHS)	1
284	R138	B3G	3001051010000	Chip resistor 100Ω J 1/16W 0402 (RoHS)	1
285	R139	B3G	3001051010000	Chip resistor 100Ω J 1/16W 0402 (RoHS)	1
286	R141	B4G	3001051010000	Chip resistor 100Ω J 1/16W 0402 (RoHS)	1
287	R142	B3F	3001051010000	Chip resistor 100Ω J 1/16W 0402 (RoHS)	1
288	R144	B2H	3001054720000	Chip resistor 4.7KΩ J 1/16W 0402 (RoHS)	1
289	R145	B3F	3001050000000	Chip resistor 0Ω J 1/16W 0402 (RoHS)	1
290	R146	T4F	3001051030000	Chip resistor 10KΩ J 1/16W 0402 (RoHS)	1
291	R147	T4E	3001051040000	Chip resistor 100KΩ F 1/16W 0402 (RoHS)	1
292	R148	T4F	3001050000000	Chip resistor 0Ω J 1/16W 0402 (RoHS)	1
293	R149	T4F	3001050000000	Chip resistor 0Ω J 1/16W 0402 (RoHS)	1
294	R201	T2F	3001052210000	Chip resistor 220Ω J 1/16W 0402 (RoHS)	1
295	R202	T2E	3001052220010	Chip resistor 2.2KΩ F 1/16W 0402 (RoHS)	1
296	R213	T2F	3001051040000	Chip resistor 100KΩ F 1/16W 0402 (RoHS)	1
297	R214	T2F	3001051020000	Chip resistor 1KΩ F 1/16W 0402 (RoHS)	1
298	R215	T2F	3001052230010	Chip resistor 22KΩ J 1/16W 0402 (RoHS)	1

No.	Ref No.	Print No.	Part No.	Description	Qty.
299	R216	T2F	3001052220010	Chip resistor 2.2KΩ F 1/16W 0402 (RoHS)	1
300	R217	T2F	3001054730000	Chip resistor 47KΩ J 1/16W 0402 (RoHS)	1
301	R218	T2E	3001051050000	Chip resistor 1MΩ F 1/16W 0402 (RoHS)	1
302	R219	T2E	3001051030000	Chip resistor 10KΩ J 1/16W 0402 (RoHS)	1
303	R220	T2F	3001050000000	Chip resistor 0Ω J 1/16W 0402 (RoHS)	1
304	R301	T3E	3001051030000	Chip resistor 10KΩ J 1/16W 0402 (RoHS)	1
305	R302	T3E	3001051040000	Chip resistor 100KΩ F 1/16W 0402 (RoHS)	1
306	R303	B2H	3001054330000	Chip resistor 43KΩ F 1/16W 0402 (RoHS)	1
307	R308	T3E	3001054790000	Chip resistor 4.7Ω J 1/16W 0402 (RoHS)	1
308	R309	T3E	3001051020000	Chip resistor 1KΩ F 1/16W 0402 (RoHS)	1
309	R310	T4E	3001054790000	Chip resistor 4.7Ω J 1/16W 0402 (RoHS)	1
310	R311	T4E	3001051000020	Chip resistor 10Ω F 1/16W 0402 (RoHS)	1
311	R405	T3A	3001051040000	Chip resistor 100KΩ F 1/16W 0402 (RoHS)	1
312	R406	B3E	3001053320010	Chip resistor 3.3KΩ F 1/16W 0402 (RoHS)	1
313	R407	T3A	3001055110000	Chip resistor 510Ω J 1/16W 0402 (RoHS)	1
314	R408	B3E	3001052200000	Chip resistor 22Ω J 1/16W 0402 (RoHS)	1
315	R409	B4E	3001053310000	Chip resistor 330Ω F 1/16 0402 (RoHS)	1
316	R410	B3D	3001054700000	Chip resistor 47Ω J 1/16W 0402 (RoHS)	1
317	R411	B3D	3001054730000	Chip resistor 47KΩ J 1/16W 0402 (RoHS)	1
318	R412	B3D	3001051030000	Chip resistor 10KΩ J 1/16W 0402 (RoHS)	1
319	R413	B4F	3001054730000	Chip resistor 47KΩ J 1/16W 0402 (RoHS)	1
320	R414	B3D	3001051020000	Chip resistor 1KΩ F 1/16W 0402 (RoHS)	1
321	R415	B3D	3001054700000	Chip resistor 47Ω J 1/16W 0402 (RoHS)	1
322	R416	B3D	3001051220000	Chip resistor 1.2KΩ J 1/16W 0402 (RoHS)	1
323	R417	B3D	3001054730000	Chip resistor 47KΩ J 1/16W 0402 (RoHS)	1
324	R418	T3B	3001062710000	Chip resistor 270Ω J 1/10W 0603 (RoHS)	1
325	R419	T3B	3099080398000	Chip resistor 0.39Ω J 1/4W 1206 (RoHS)	1
326	R420	T3B	3099080398000	Chip resistor 0.39Ω J 1/4W 1206 (RoHS)	1
327	R421	T3B	3099080398000	Chip resistor 0.39Ω J 1/4W 1206 (RoHS)	1
328	R422	T3B	3001061540010	Chip resistor 150KΩ D 1/10W 0603 (RoHS)	1
329	R423	T2B	3001061540010	Chip resistor 150KΩ D 1/10W 0603 (RoHS)	1
330	R424	T2B	3001061040000	Chip resistor 100KΩ D 1/10W 0603 (RoHS)	1
331	R425	T2B	3001061540010	Chip resistor 150KΩ D 1/10W 0603 (RoHS)	1
332	R426	T2B	3001061540010	Chip resistor 150KΩ D 1/10W 0603 (RoHS)	1
333	R427	T2B	3001061040000	Chip resistor 100KΩ D 1/10W 0603 (RoHS)	1
334	R428	T3A	3001051030000	Chip resistor 10KΩ J 1/16W 0402 (RoHS)	1
335	R430	T3A	3001051020000	Chip resistor 1KΩ F 1/16W 0402 (RoHS)	1
336	R437	T3B	3001054720000	Chip resistor 4.7KΩ J 1/16W 0402 (RoHS)	1
337	R438	T3B	3001058230000	Chip resistor 82KΩ J 1/16W 0402 (RoHS)	1
338	R439	T3B	3001053330010	Chip resistor 33KΩ J 1/16W 0402 (RoHS)	1
339	R440	B3E	3001053320010	Chip resistor 3.3KΩ F 1/16W 0402 (RoHS)	1
340	R442	T3D	3001051000020	Chip resistor 10Ω F 1/16W 0402 (RoHS)	1
341	R444	T3B	3001062710000	Chip resistor 270Ω J 1/10W 0603 (RoHS)	1
342	R511	B2D	3210305229010	Multi-layer chip inductor 2.2nH S 300mA 0.12ohm Q:8 0402 (RoHS)	1

No.	Ref No.	Print No.	Part No.	Description	Qty.
343	R512	B2E	3001051030000	Chip resistor 10KΩ J 1/16W 0402 (RoHS)	1
344	R514	B2D	3001053920000	Chip resistor 3.9KΩ F 1/16W 0402 (RoHS)	1
345	R515	B2D	3001051020000	Chip resistor 1KΩ F 1/16W 0402 (RoHS)	1
346	R519	B2E	3001055100020	Chip resistor 51Ω F 1/16W 0402 (RoHS)	1
347	R520	B3E	3210305220000	Multi-layer chip inductor 0402 22nH Q(min.)8 (RoHS)	1
348	R523	B3E	3001050000000	Chip resistor 0Ω J 1/16W 0402 (RoHS)	1
349	R602	B4I	3001051040000	Chip resistor 100KΩ F 1/16W 0402 (RoHS)	1
350	R603	B4I	3001052240000	Chip resistor 220KΩ J 1/16W 0402 (RoHS)	1
351	R604	B3I	3001051010000	Chip resistor 100Ω J 1/16W 0402 (RoHS)	1
352	R605	T4A	3001056810000	Chip resistor 680Ω J 1/16W 0402 (RoHS)	1
353	R607	T4B	3001058220010	Chip resistor 8.2KΩ F 1/16W 0402 (RoHS)	1
354	R609	B5A	3001064710000	Chip resistor 470Ω J 1/10W 0603 (RoHS)	1
355	R614	B4G	3001051010000	Chip resistor 100Ω J 1/16W 0402 (RoHS)	1
356	R616	B4H	3001054730000	Chip resistor 47KΩ J 1/16W 0402 (RoHS)	1
357	R617	B4H	3001054730000	Chip resistor 47KΩ J 1/16W 0402 (RoHS)	1
358	R618	B5H	3001054700000	Chip resistor 47Ω J 1/16W 0402 (RoHS)	1
359	R619	B4H	3001054700000	Chip resistor 47Ω J 1/16W 0402 (RoHS)	1
360	R621	B4G	3001051020000	Chip resistor 1KΩ F 1/16W 0402 (RoHS)	1
361	R623	B3I	3001051010000	Chip resistor 100Ω J 1/16W 0402 (RoHS)	1
362	R624	B3I	3001051030000	Chip resistor 10KΩ J 1/16W 0402 (RoHS)	1
363	R625	T4A	3001052220010	Chip resistor 2.2KΩ F 1/16W 0402 (RoHS)	1
364	R626	T3A	3001051020000	Chip resistor 1KΩ F 1/16W 0402 (RoHS)	1
365	R627	T4H	3001051530000	Chip resistor 15KΩ J 1/16W 0402 (RoHS)	1
366	R628	T4H	3001051050000	Chip resistor 1MΩ F 1/16W 0402 (RoHS)	1
367	R629	T3H	3001051060000	Chip resistor 10M J 1/16W 0402 (RoHS)	1
368	R631	T4G	3001051830010	Chip resistor 18KΩ F 1/16W 0402 (RoHS)	1
369	R632	T4G	3001051830010	Chip resistor 18KΩ F 1/16W 0402 (RoHS)	1
370	R633	T4H	3001051000020	Chip resistor 10Ω F 1/16W 0402 (RoHS)	1
371	R634	T4H	3001052240000	Chip resistor 220KΩ J 1/16W 0402 (RoHS)	1
372	R635	T3H	3001050000000	Chip resistor 0Ω J 1/16W 0402 (RoHS)	1
373	R636	T4H	3001051830010	Chip resistor 18KΩ F 1/16W 0402 (RoHS)	1
374	R637	B5A	3001064710000	Chip resistor 470Ω J 1/10W 0603 (RoHS)	1
375	R638	T4H	3001051830010	Chip resistor 18KΩ F 1/16W 0402 (RoHS)	1
376	R639	T4H	3001051830010	Chip resistor 18KΩ F 1/16W 0402 (RoHS)	1
377	R640	T4H	3001051020000	Chip resistor 1KΩ F 1/16W 0402 (RoHS)	1
378	R644	B2I	3001054720000	Chip resistor 4.7KΩ J 1/16W 0402 (RoHS)	1
379	R645	B2I	3001054720000	Chip resistor 4.7KΩ J 1/16W 0402 (RoHS)	1
380	R646	B4E	3001051020000	Chip resistor 1KΩ F 1/16W 0402 (RoHS)	1
381	R647	B3I	3001050000000	Chip resistor 0Ω J 1/16W 0402 (RoHS)	1
382	R683	T3I	3001054720000	Chip resistor 4.7KΩ J 1/16W 0402 (RoHS)	1
383	R684	T3I	3001054720000	Chip resistor 4.7KΩ J 1/16W 0402 (RoHS)	1
384	R685	B2I	3001051030000	Chip resistor 10KΩ J 1/16W 0402 (RoHS)	1
385	R686	B2I	3001051030000	Chip resistor 10KΩ J 1/16W 0402 (RoHS)	1
386	R687	B2H	3001051020000	Chip resistor 1KΩ F 1/16W 0402 (RoHS)	1

No.	Ref No.	Print No.	Part No.	Description	Qty.
387	R688	B2H	3001051020000	Chip resistor 1KΩ F 1/16W 0402 (RoHS)	1
388	R689	B1E	3001050000000	Chip resistor 0Ω J 1/16W 0402 (RoHS)	1
389	R690	B4G	3001051020000	Chip resistor 1KΩ F 1/16W 0402 (RoHS)	1
390	R691	B4G	3001051020000	Chip resistor 1KΩ F 1/16W 0402 (RoHS)	1
391	R692	B4G	3001051020000	Chip resistor 1KΩ F 1/16W 0402 (RoHS)	1
392	R693	B4G	3001051020000	Chip resistor 1KΩ F 1/16W 0402 (RoHS)	1
393	R694	B1B	3001050000000	Chip resistor 0Ω J 1/16W 0402 (RoHS)	1
394	SW601	T3A	4301080000020	Momentary contact12VDC 0.05A SMD (RoHS)	1
395	U101	B3F	3613999000020	Baseband processor IC 3.3V -25~85 5dBm -124dBm (RoHS)	1
396	U301	T3E	3602012000020	Audio amplifier IC 1W(8ohm) 2.2-5.5V 8uMAX (RoHS)	1
397	U401	T3B	3605008005070	Operational amplifier 3~32V 300mW 100dB 2 (RoHS)	1
398	U603	B4H	3612031000510	Memory EEPROM 16KB 1.7~5.5V SOIC-8 (RoHS)	1
399	U605	B2I	3609006000000	Reset IC 2.7V SC-82 (RoHS)	1
400	U606	T4B	3615042000010	Power management IC 4.2V 1.2A UDFN-8 (RoHS)	1
401	U613	T4H	3605008005070	Operational amplifier 3~32V 300mW 100dB dual-operation SSOP8 (RoHS)	1
402	U619	B5G	3608006000040	Power management IC LDO 1.7--5.25V 3.0V 300mA (RoHS)	1
403	U621	B5E	3608015000210	Power management IC LDO 12V 3.3V 300mA (RoHS)	1
404	U622	B3H	3609042000020	MCU 8 2.8~5V 20MHZ LQFP 64 (RoHS)	1
405	UP	T1B	4301080000090	Momentary contact 12VDC 0.05A TC-320 SMD (RoHS)	1
406	X601	T3H	3701327610060	Crystal 32.768KHz ±20ppm 12.5pF SMD (RoHS)	1
407	XT101	T2G	3701002660130	TCXO 26MHz 3.135V~3.465V ±2.5ppm 3225 (RoHS)	1
408	/	B2C	7000183000000	Heat sink 3*5*1.5mm 00 (RoHS)	1
409	/	B3C	7000183000000	Heat sink 3*5*1.5mm 00 (RoHS)	1
410	/	/	6201648000000	VCO shielding mask 0.30mm 00 (RoHS)	1
411	/	/	6201651000000	Filter shielding mask 0.20mm 00 (RoHS)	1
412	/	/	6201865000000	Crystal shielding mask T0.20mm 00 (RoHS)	1
413	/	/		PCB board IT158 4L 4P 89.80*38.93*1.2 (RoHS)	1

7. Tuning Description

7.1 Required Test Instruments

- Radio communication test set (HP8921) 1 set
- 10V/3A regulated DC power supply 1 set
- Digital voltmeter 1 set
- Ammeter 1 set

7.2 Preparations

Place the board to be tested on the test fixture (please ensure good connection between each test point and the fixture), and connect the board to a power supply with DC voltage of 3.8V.

Wired Clone

7.2.1 Instructions:

- Connect two radios using a cloning cable. Simultaneously hold down SK (Side Key) to power on the source radio so that the wired clone mode will be entered after 2 seconds, and then press SK to switch to factory wired clone mode (when the wired clone mode is entered, the user wired clone mode is defaulted); then directly power on the target radio to enter the user mode.
- The Status Indicator flashes red once after the source radio enters Wired Clone mode. Press **PTT** to clone data to the target radio.
- During communication, the Status Indicator of the source radio glows red, and the Status Indicator of the target radio glows green. When the communication ends, green LED of the source radio glows and the green LED of the target radio goes out, which indicates the preparation for another clone.
- If any abnormal situation occurs during communication, the source radio will flash orange Status Indicator and will stop communication for another cloning.
- When cloning ends, the source radio goes back to the standby status. Press **PTT** again to begin another cloning operation.

7.2.2 LED Indication during Cloning

- Orange LED flashes: an error occurs during cloning. In this case, press any key other than the power switch to turn it off.
- Green LED glows: the cloning is done successfully.

7.2.3 Difference between Factory Clone Mode and User Clone Mode

- User Clone Mode: Only clone relevant data in user mode (such as frequencies). Test parameters like test frequency, test item and base band parameter will not be cloned.
- Factory Clone Mode: Clone all the data excluding serial No.

• Description of Tuning Items

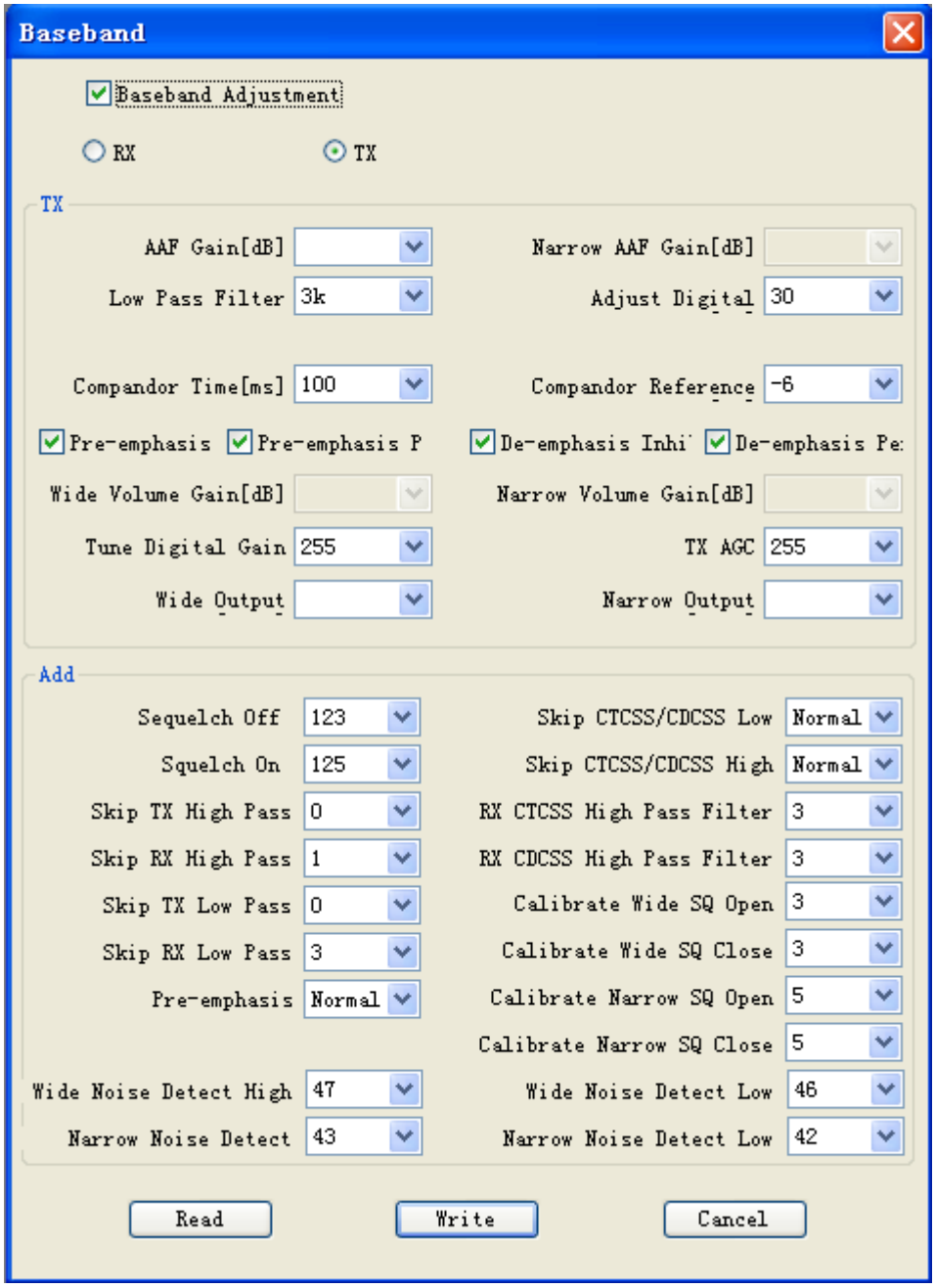
Channel	Tunable Frequency	Wide Band					Narrow Band				
		Freq. 1	Freq. 2	Freq. 3	Freq. 4	Freq. 5	Freq. 1	Freq. 2	Freq. 3	Freq. 4	Freq. 5
TX Circuit											
1	Freq. Tolerance	/	/	Y	/		/	/	/	/	/
2	TX Low Power	Y	Y	Y	Y	Y	/	/	/	/	/
3	TX High Power	Y	Y	Y	Y	Y	/	/	/	/	/
4	CDCSS Deviation	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
5	CTCSS Deviation (low)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
6	CTCSS Deviation (medium)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
7	CTCSS Deviation (high)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
8	TX Low Voltage Threshold	/	/	Y	/	/	/	/	/	/	/
9	Max. TX Audio Deviation	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
RX Circuit											
10	RX Low Voltage Threshold	/	/	Y	/	/	/	/	/	/	/

Channel	Tunable Frequency	Wide Band					Narrow Band				
11	Max. RX Audio Power		/	Y	/	/	/	/	/	/	/

Note:

Y indicates frequencies available for tuning, and the rest are blank channels without tuning items.

7.3 Baseband Design



In the above window, only the items in “Add” area are applicable to RDA chip. Values of all items are given below:

Description:

- Squelch On/Off: to set the threshold value for enabling/disabling the squelch function.
- Calibrate Wide/Narrow SQ Open/Close: to tune the squelch threshold to compensate the circuit difference. It is recommended to apply the same value to one model. Increasing the value may tighten the squelch, while decreasing may loosen it.
- Skip RX/TX High/Low Pass: to configure the audio filter (0: not skip; 1: to skip one filter; 2: to skip the other filter; 3: to skip two filters).
- Pre-emphasis: to configure the pre-emphasis function.
- Skip CTCSS/CDCSS High/Low: to set whether to skip CTCSS/CDCSS filter.
- CTCSS/CDCSS High Pass Filter: to configure the parameters of CTCSS/CDCSS filter.
- Wide/Narrow Noise Detect High/Low: to configure the noise detection threshold.

Note:

It is recommended to set the Squelch Off to -121dBm (Wide) or -120dBm (Narrow), and set the Squelch On to -122dBm (Wide) and -121dBm (Narrow). When the values from your actual test vary greatly with those in the above table, you can calibrate this problem by making Wide/Narrow SQ Open/Close.

7.4 Method and Procedure:

7.4.1 Description of Tuning Procedures

Simultaneously hold **PTT**, **SK** and **Power On/Off Key** for more than 2s to enter tuning mode (Status Indicator flashes orange). After the keys are released, the radio will enter the tuning item in this mode

(the item entered depends on the position where the **Channel Selector Knob** locates). And the Status Indicator will glow red or green according to the specific tuning item.

Or connect a programming cable to the radio for real-time tuning in PC Programming Mode.

7.4.2 Description of Tuning Items

Switch of Wide/Narrow Bandwidth and Frequency in an Tuning Item

When adjusting a certain item, long press **PTT** (Status Indicator flashes orange indicating valid press) to switch between wide/narrow bandwidth. After this operation, the first frequency of current bandwidth is the frequency for adjustment by default.

Tuning Items

- TX Items:

  TX Frequency Tolerance, TX Low Power, TX High Power, CDCSS Deviation, CTCSS Deviation (low), CTCSS Deviation (medium), CTCSS Deviation (high), TX Low Voltage Threshold and Max. Deviation. (Note: These items are tuned inside the tuning mode.)

- RX Items

  RX Low Voltage Threshold and Max. Audio Power

7.4.3 Specific Operations and Requirements

Note:

By default, channel 1, 2, 3, 4 and 5 use wide band, while channel 6, 7, 8, 9 and 10 use narrow band. Remember to connect the antenna properly.

Tuning Items for TX

Item	Condition	Measurement		Tuning		Specifications / Remarks
		Test Instrument	Test Point	Component	Method	
Freq. Tolerance	Hold **PTT**+**SK** to power on the radio, and then go to channel 1.	Communication test set	Antenna connector	Press **UP** or **DOWN** key	Press **UP** or **Down** to tune the TX carrier frequency tolerance. Save your change and go to another channel.	＜150Hz

Item		Condition	Measurement		Tuning		Specifications / Remarks
TX Power	Low	Hold **PTT**+**SK** to power on the radio, and then go to channel 2.	Communication Test Set / Ammeter	Antenna connector	Press **UP** or **DOWN** key	Press UP or DOWN to tune the TX power. Then save your change and go to another channel.	UHF: 0.5W±0.2W I≤0.8A
		Short press **PTT** to switch the frequency under test.					
	High	Hold **PTT**+**SK** to power on the radio, and then go to channel 3.				Press UP or DOWN to tune the TX power. Then save your change and go to another channel.	2W±0.2W I≤1.4A
		Short press **PTT** to switch the frequency under test.					
CDCSS Deviation	Wide Band	Hold **PTT**+**SK** to power on the radio, and then go to channel 4.	Communication test set BPF: <20Hz-300Hz AF Genl	Antenna connector	Press **UP** or **DOWN** key	Press **UP** or **DOWN** to tune the CDCSS deviation. Then save your change and go to another channel.	650±50Hz
		Short press **PTT** to					

Item		Condition	Measurement		Tuning		Specifications / Remarks
		switch the frequency under test.	Lvl: off				
	Narrow Band	Following wideband test, long press **PTT** to perform narrow band test.					400±50Hz
		Short press **PTT** to switch the frequency under test.					
CTCSS Deviation	Low	Hold **PTT**+**SK** to power on the radio, and then go to channel 5. Short press **PTT** to switch the frequency.	Communication Test Set BPF: <20Hz~300Hz AF Genl Lvl: off	Antenna connector	Press **UP** or **DOWN** key	Press **UP** or **DOWN** to tune the CTCSS deviation. Then save your change and go to another channel.	Wide band: 675±50Hz Narrow band: 400±50Hz
		Following wideband test, long press **PTT** to perform narrow band					

Item		Condition	Measurement		Tuning		Specifications / Remarks
		test.					
	Medium	Hold **PTT**+**SK** to power on the radio, and then go to channel 6. Short press **PTT** to switch the frequency.					
		Following wideband test, long press **PTT** to perform narrow band test.					
	High	Hold **PTT**+**SK** to power on the radio, and then go to channel 7. Short press **PTT** to switch the frequency.					
		Following wideband test,					

Item		Condition	Measurement		Tuning		Specifications / Remarks
		long press **PTT** to perform narrow band test.					
Max. TX Audio Deviation	Wide Band	Hold **PTT**+**SK** to power on the radio, and then go to channel 9. Short press **PTT** to switch the frequency.	Communication Test Set BPF: <20Hz~15 KHz AF Genl Lvl: 120mV	Antenna Bracket for earpiece jack	Press **UP** or **DOWN** key	Press **UP** or **DOWN** to tune the audio deviation. Then save your change and go to another channel.	4.3KHz – 4.5KHz
	Narrow Band	Following wideband test, long press **PTT** to perform narrow band test.					2.1KHz – 2.3KHz
TX Low Voltage Threshold		Hold **PTT**+**SK** to power on the radio, and then go to channel 8.	Digital voltmeter	Power Supply Port	Power Supply	Adjust the power supply to 3.42V and press **UP** or **DOWN** to sample it. Then save your change and go to another channel.	In case of ≤3.42V, TX is inhibited.

Note:

Make sure that the antenna or load is connected before tuning; rotating the **Channel Selector Knob** will save the value automatically.

7.5 Appendix 1:

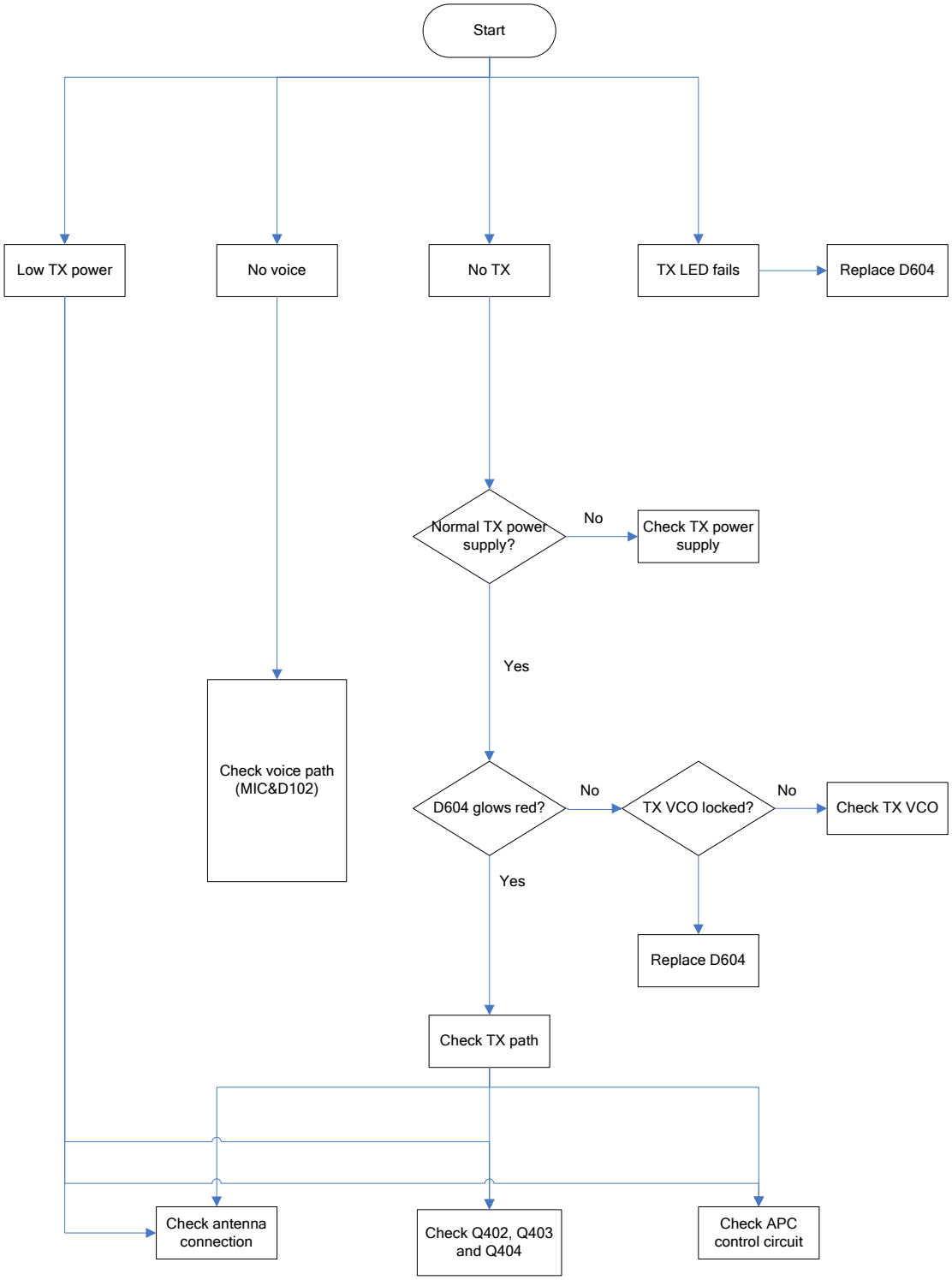
Appendix 1: Reference Value for Source Radio

Item		Wide Band					Narrow Band				
		Freq. 1	Freq. 2	Freq. 3	Freq. 4	Freq. 5	Freq. 1	Freq. 2	Freq. 3	Freq. 4	Freq. 5
Tx Item Section											
Freq. Tolerance		/	/	133	/	/	/	/	/	/	/
TX Low Power		75	65	69	69	63	/	/	/	/	/
TX High Power		128	133	135	135	126	/	/	/	/	/
CDCSS Deviation		16	16	16	16	16	18	18	18	18	18
CTCSS Deviation (low)		25	25	25	25	25	32	32	32	32	32
CTCSS Deviation (medium)		25	25	25	25	25	32	32	32	32	32
CTCSS Deviation (high)		27	27	27	27	27	35	35	35	35	35
TX Low Voltage Threshold		/	/	200	/	/	/	/	/	/	/
VOX Gain	VOX GAIN1	/	/	120	/	/	/	/	/	/	/
	VOX GAIN2	/	/	90	/	/	/	/	/	/	/
	VOX GAIN3	/	/	60	/	/	/	/	/	/	/

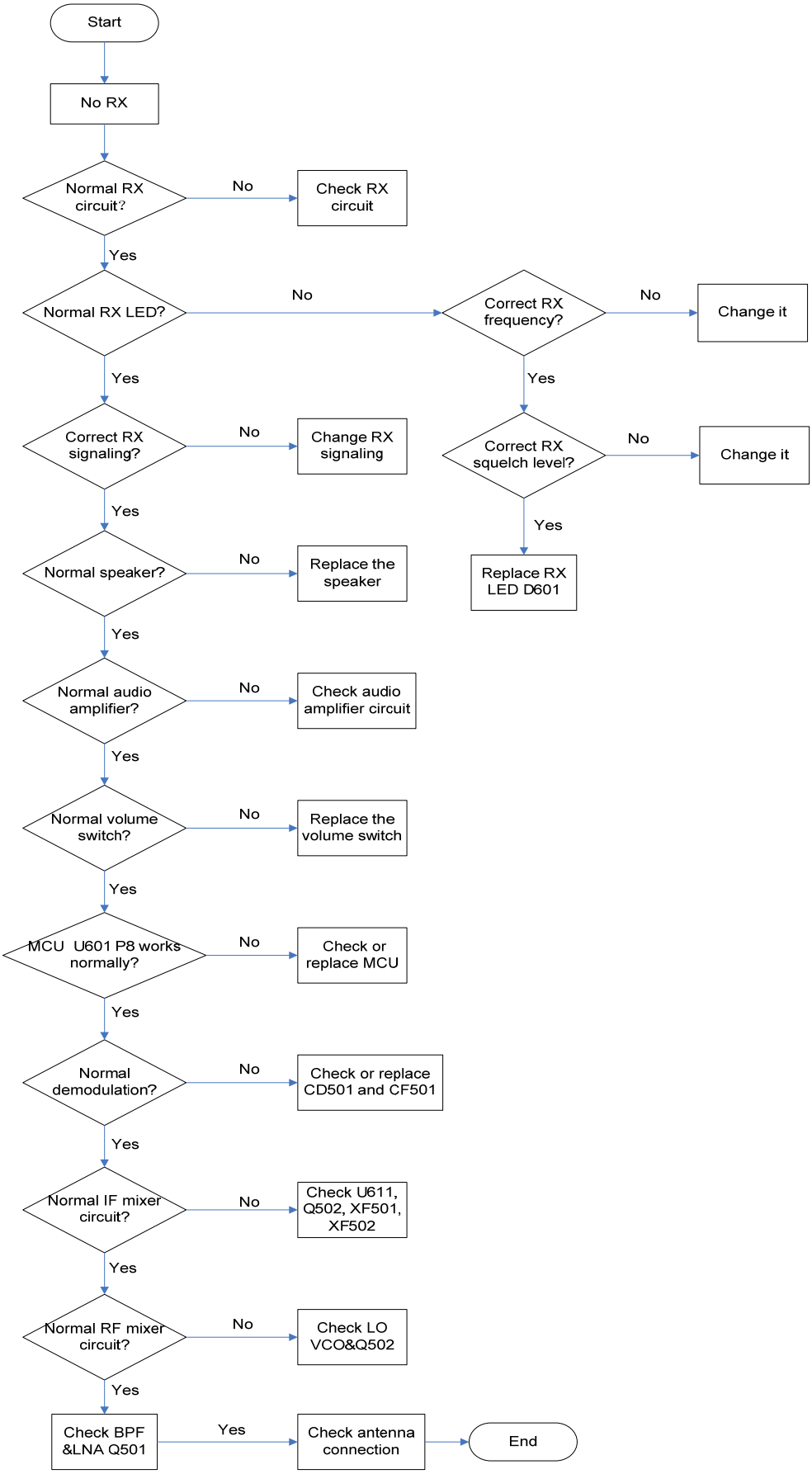
Item	Wide Band					Narrow Band				
Max. TX Audio Deviation	54	54	54	54	54	52	52	52	52	52
Rx Item Section										
Squelch Normal On	/	/	/	/	/	/	/	/	/	/
Squelch Tight On	/	/	/	/	/	/	/	/	/	/
Squelch Normal Off	/	/	/	/	/	/	/	/	/	/
Squelch Tight Off	/	/	/	/	/	/	/	/	/	/
RX Low Voltage Threshold	/	/	205	/	/	/	/	/	/	/
Max. RX Audio Power	/	/	205	/	/	/	/	/	/	/

8. Troubleshooting Flow Chart

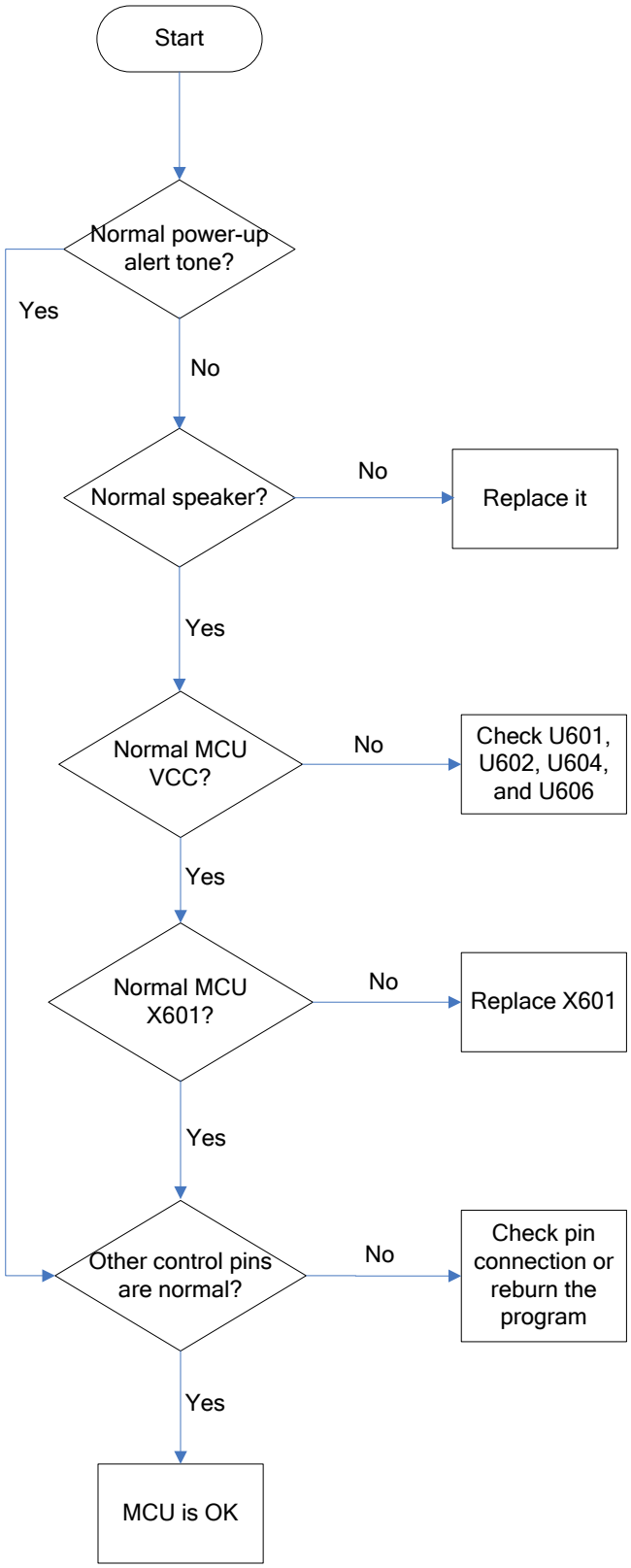
TX Circuit



RX Circuit


Start
No RX
Normal RX circuit?
No
Check RX circuit
Yes
Normal RX LED?
No
Correct RX frequency?
No
Change it
Yes
Yes
Correct RX signaling?
No
Change RX signaling
Correct RX squelch level?
No
Change it
Yes
Yes
Normal speaker?
No
Replace the speaker
Replace RX LED D601
Yes
Normal audio amplifier?
No
Check audio amplifier circuit
Yes
Normal volume switch?
No
Replace the volume switch
Yes
MCU U601 P8 works normally?
No
Check or replace MCU
Yes
Normal demodulation?
No
Check or replace CD501 and CF501
Yes
Normal IF mixer circuit?
No
Check U611, Q502, XF501, XF502
Yes
Normal RF mixer circuit?
No
Check LO VCO&Q502
Yes
Check BPF &LNA Q501
Yes
Check antenna connection
End

MCU

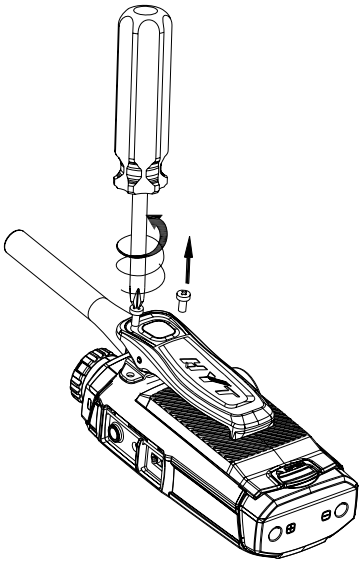

Start
Normal power-up alert tone?
Yes
No
Normal speaker?
No
Replace it
Yes
Normal MCU VCC?
No
Check U601, U602, U604, and U606
Yes
Normal MCU X601?
No
Replace X601
Yes
Other control pins are normal?
No
Check pin connection or reburn the program
Yes
MCU is OK

9. Disassembly and Assembly

9.1 Disassembly

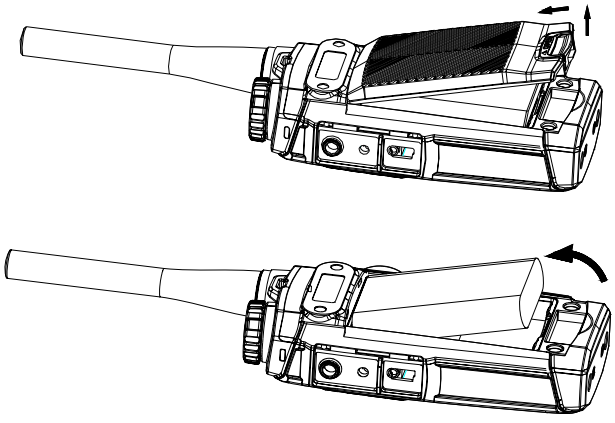
Step 1 Powering off the radio

Step 2 Removing the belt clip

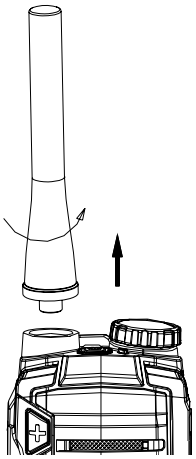


Step 3 Removing the battery

1. Push the battery latch upwards;
2. Remove the battery cover;
3. Take out the battery by lifting its bottom side.

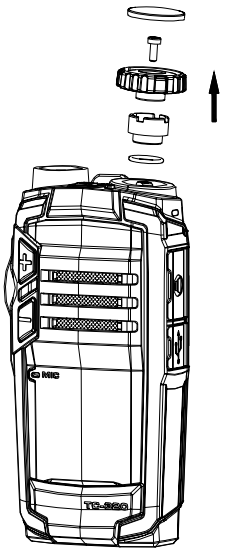


Step 4 Removing the antenna



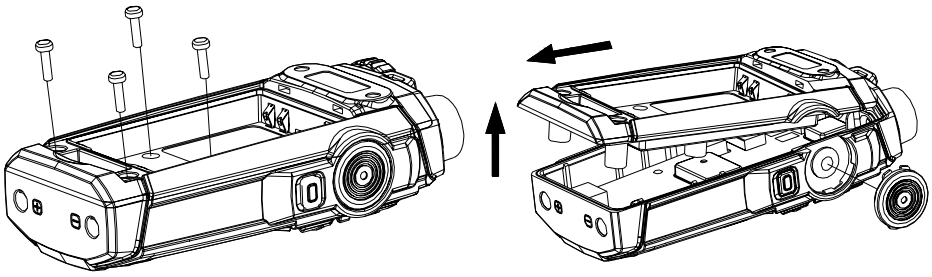
Step 5 Removing the Channel Selector Knob, nut and waterproof ring

1. Detach the Channel Selector Knob cover;
2. Unfasten the screw;
3. Remove the channel selector knob;
4. Remove the nut and waterproof ring.



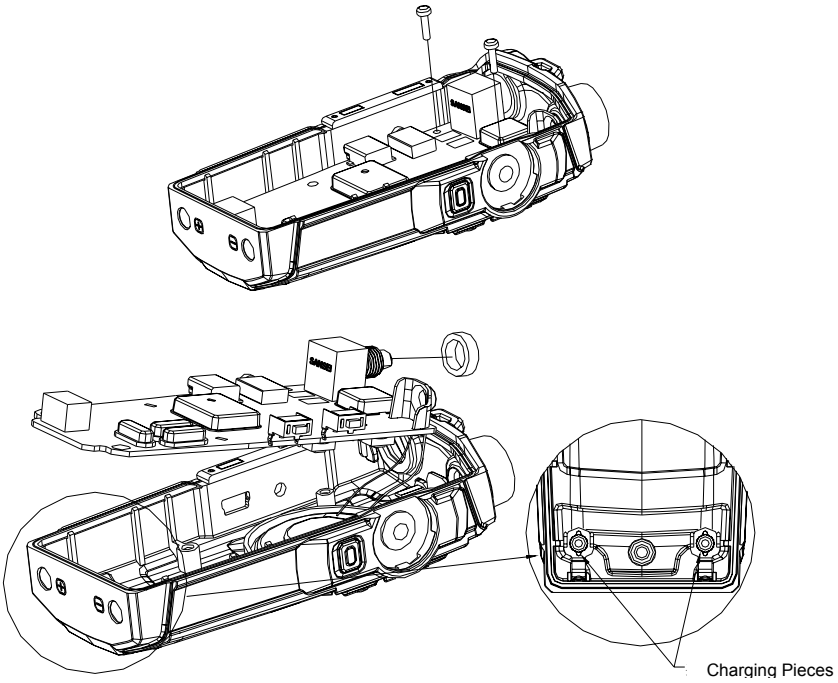
Step 6 Disassembling the radio chassis and the cover of PTT key

1. Unfasten the four screws on the chassis;
2. Lift the bottom of the chassis;
3. Pull the chassis out.
4. Remove the cover of PTT key.



Step 7 Disassembling the main PCB

1. Remove the two fixing screws on the PCB;
2. Remove the PCB and supporting ring of the Channel Selector Knob.
3. Beware of the speaker cable and the charging piece at the bottom.

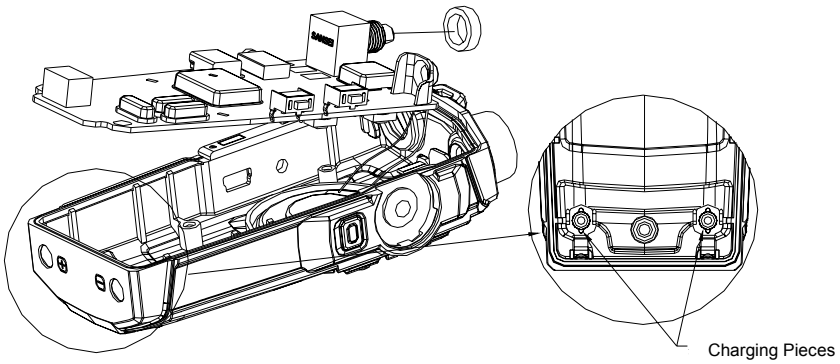


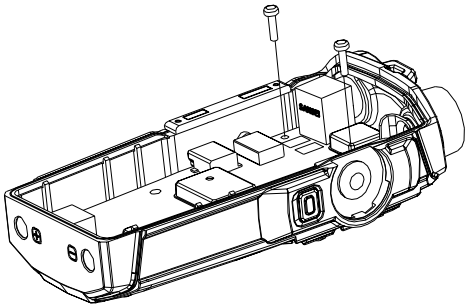
9.2 Assembly

Step 1 Installing the main PCB

1. Make sure that the speaker is well connected, and the charging piece on the bottom is correctly installed;
2. Install the supporting ring of the Channel Selector Knob;
3. Attach the main PCB;
4. Attach and secure two screws (Note: Control the torsion force within 0.8-1.2kgf);

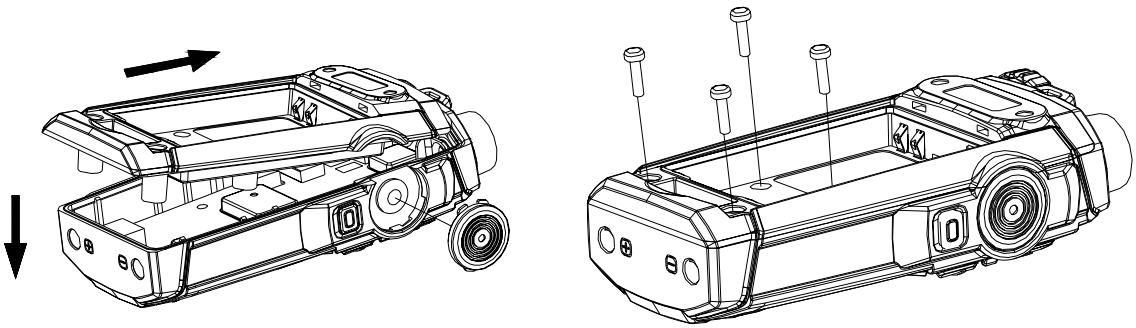
5. Don’t damage the speaker cable during installation.





Step 2 Assembling the chassis

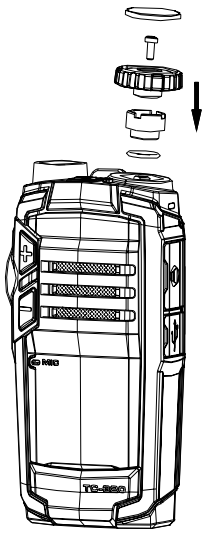
1. Assemble the cover of PTT key;
2. Assembling the chassis;
3. Attach and secure the four fixing screws (Note: Control torsion force within 1.8-2.2kgf).



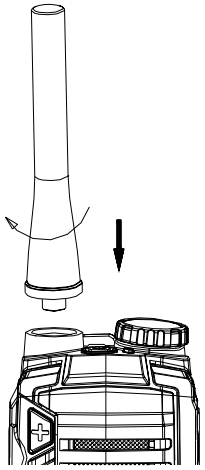
Step 3 Assembling the nut and Channel Selector Knob on the top

1. Attach and secure the nut on the top of the radio (with a waterproof ring);
2. Attach the Channel Selector Knob;
3. Attach and secure the fixing screws;

4. Attach and secure the Channel Selector Knob cover;

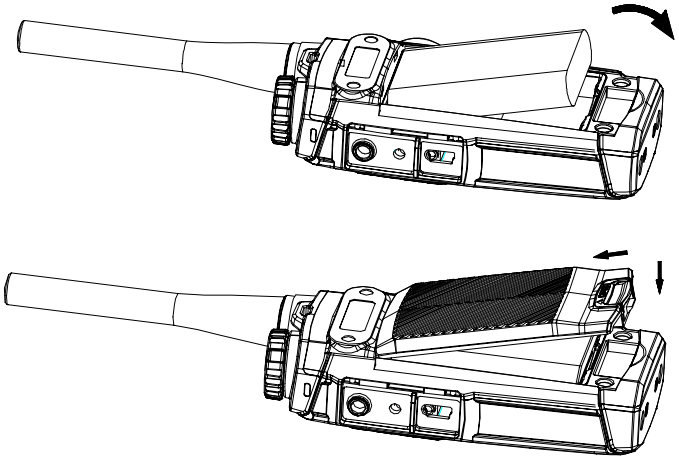


Step 4 Assembling the antenna

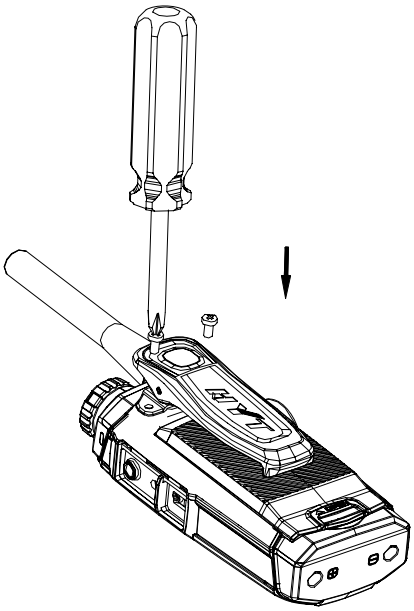


Step 5 Attaching the battery

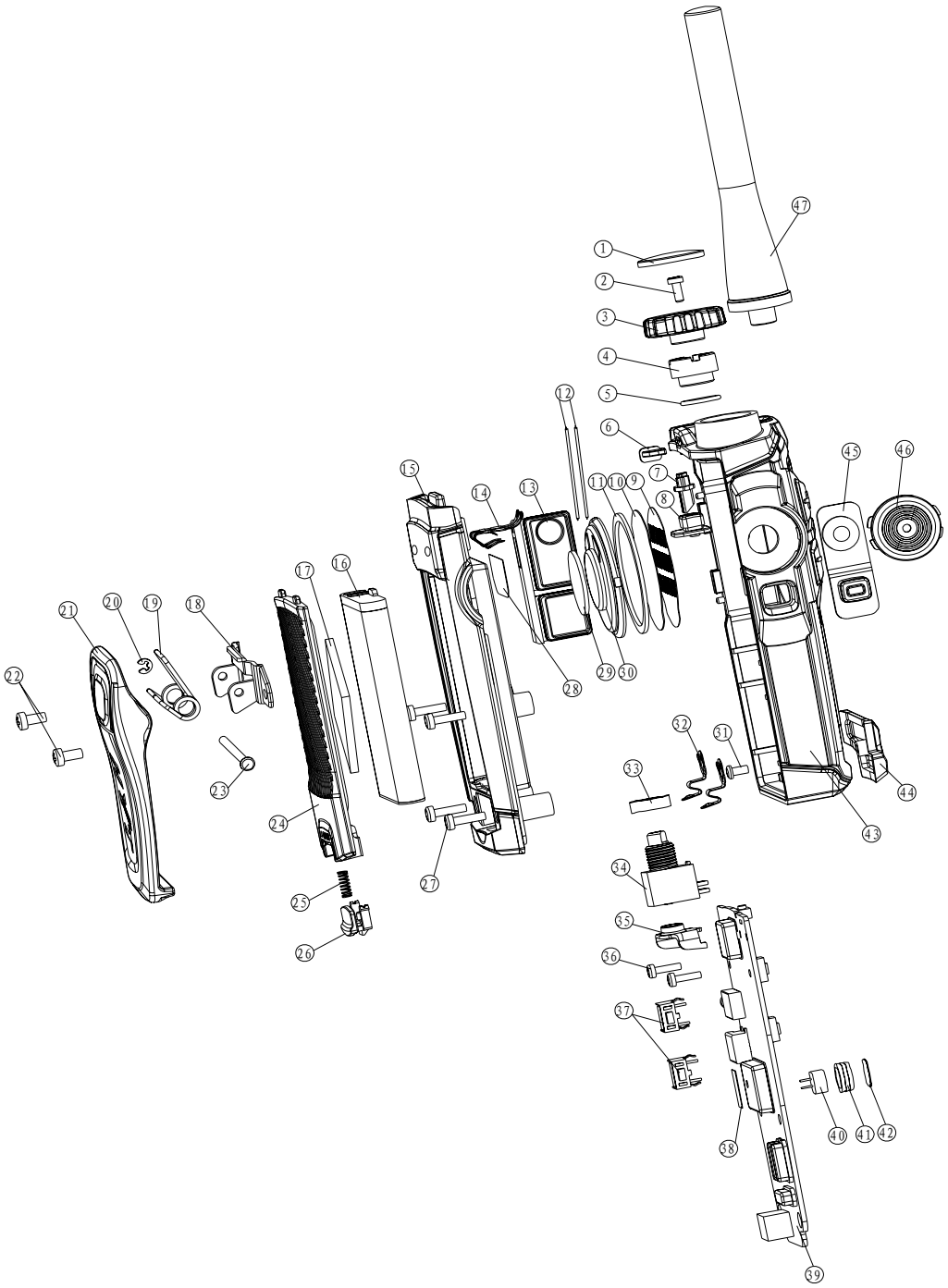
1. Load the battery;
2. Attach the battery cover.



Step 6 Attaching the belt clip



10. Exploded View



11. Parts List 2

No.	Part No.	Description	Qty.
1	6201658001010	Encoder knob cover	1
2	7102006000100	Machine screw M2.0*6.0mm	1
3	6000718100000	Encoder knob	1
4	7206007400000	Encoder switch nut	1
5	6100335000000	Antenna O_Ring	1
6	6000737100010	Light guide of charging LED	1
7	6000736100000	Light guide for signal LED	1
8	6100363000010	POWER key	1
9	6201644000000	Steel speaker felt	1
10	7400229000000	Speaker felt	1
11	7500250000000	Speaker washer	1
12	4210038000000	Signal cable	2
13	6000739000030	Accessory jack cover	1
14	6201643000000	Battery discharging piece	2
15	6000734000010	Bottom case	1
16	/	Li-Ion battery pack	1
17	7500304000000	PORON pad for battery (thick) cover	2
18	6201796000000	Metal bracket for belt clip	1
19	7000205000000	Belt clip spring	1

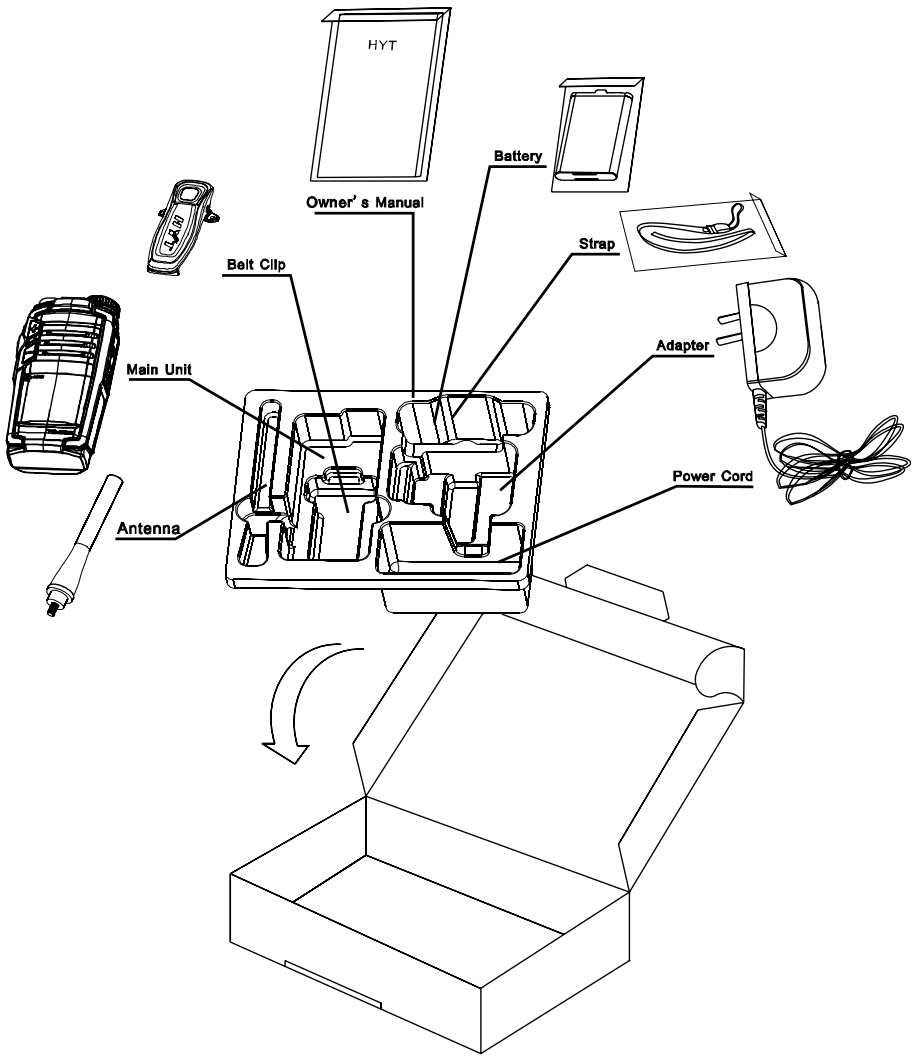
No.	Part No.	Description	Qty.
20	7000181000000	Fender washer (open)	1
21	6000836000010	Belt clip	1
22	7102505000200	Machine screw M2.5*4.8mm	2
23	7000206000000	Shaft for belt clip	1
24	6000758000000	Battery (thick) cover	1
25	7000179000000	Spring for battery latch	1
26	6000738000000	Battery latch	1
27	7102008020100	Self-tapping screw 2.0*8.0mm	4
28	7400233000000	PCB shield sheet	1
29	7400034000000	Insulation sheet for speaker	1
30	5001000000090	Speaker	1
31	7101904020200	Self-tapping screw 1.9*4.0mm	1
32	6201671000000	Radio charging piece	2
33	7209802800010	Support ring of encoder switch	1
34	4304030000030	Gray code rotary switch	1
35	6201653000020	Antenna bracket	1
36	7101704020100	Self-tapping screw 1.7*4.0mm	2
37	4301040000060	Momentary contact	2
38	7600020000000	3M embossed copper foil	1
39	/	Main PCB	1

No.	Part No.	Description	Qty.
40	5002230000010	MIC	1
41	6100111000010	Silicone rubber MIC cover	1
42	7400077000000	MIC Net	1
43	6000732001040	Front case	1
44	6300062001010	Decorative sheet, zinc alloy	1
45	6100365000000	Silicone rubber PTT key	1
46	6000735000020	PTT key	1
47	/	Antenna	1

Note:

Parts that are not marked with part number may vary with radio frequency band.

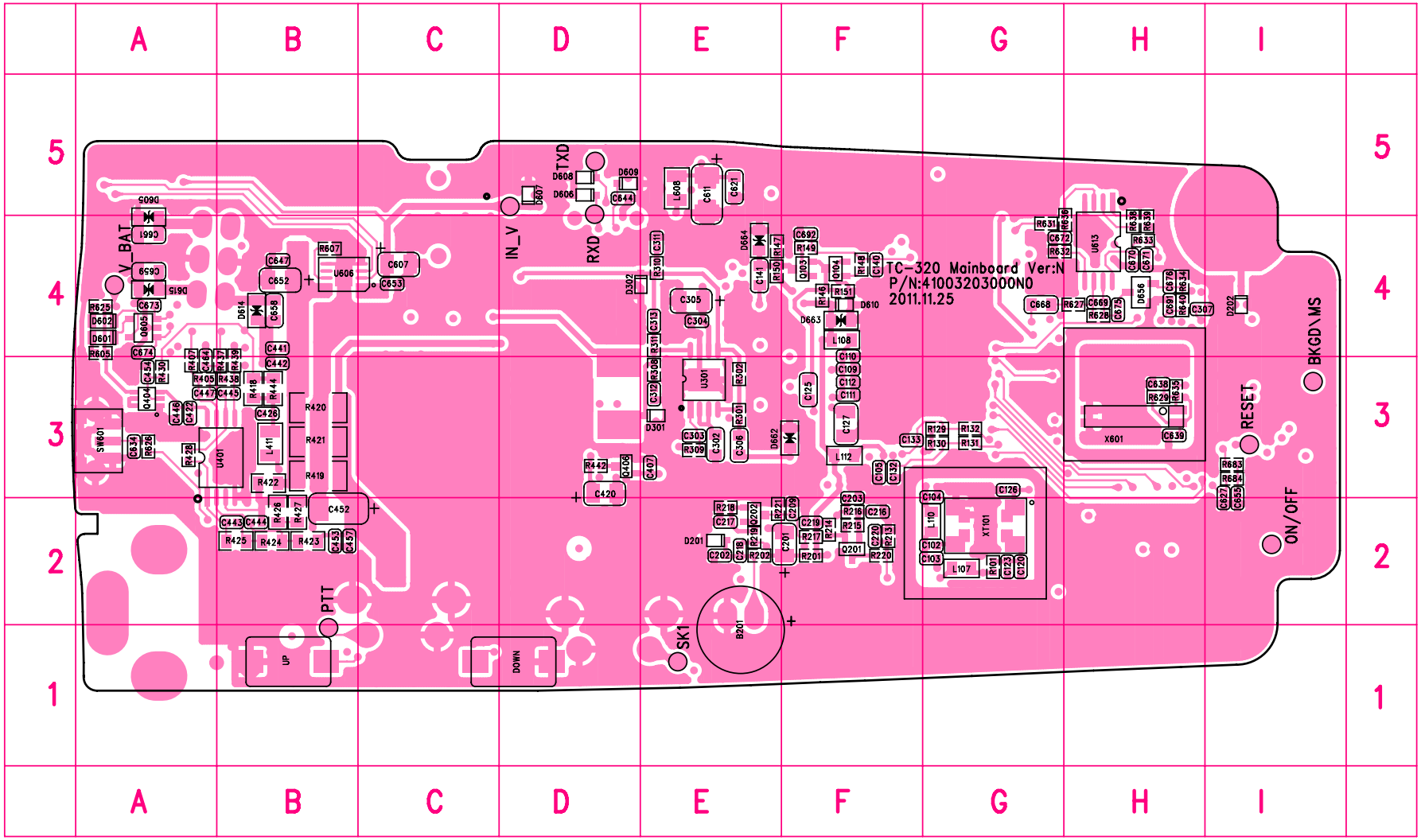
12. Packing Guide



13. PCB View

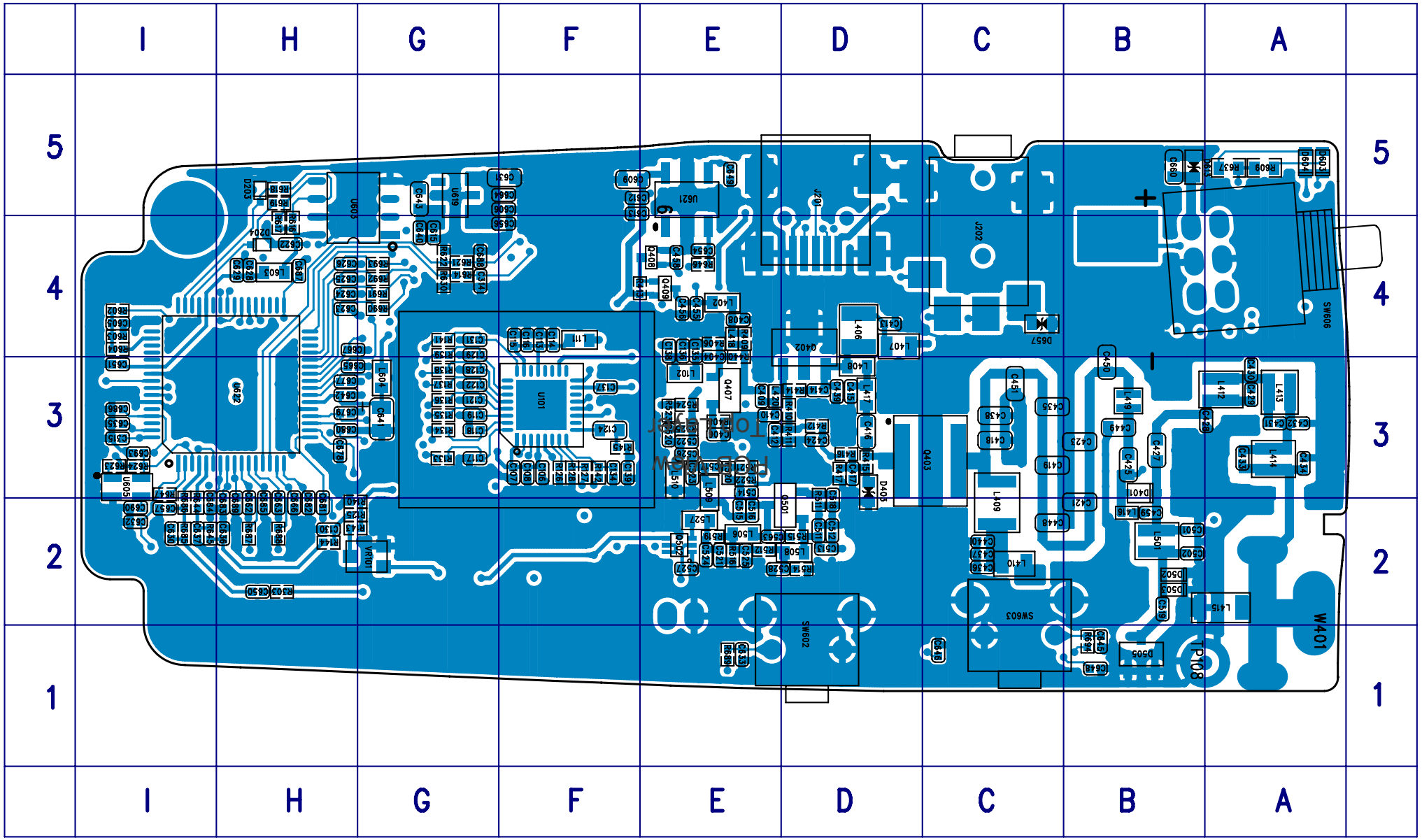
PCB View

Top Layer

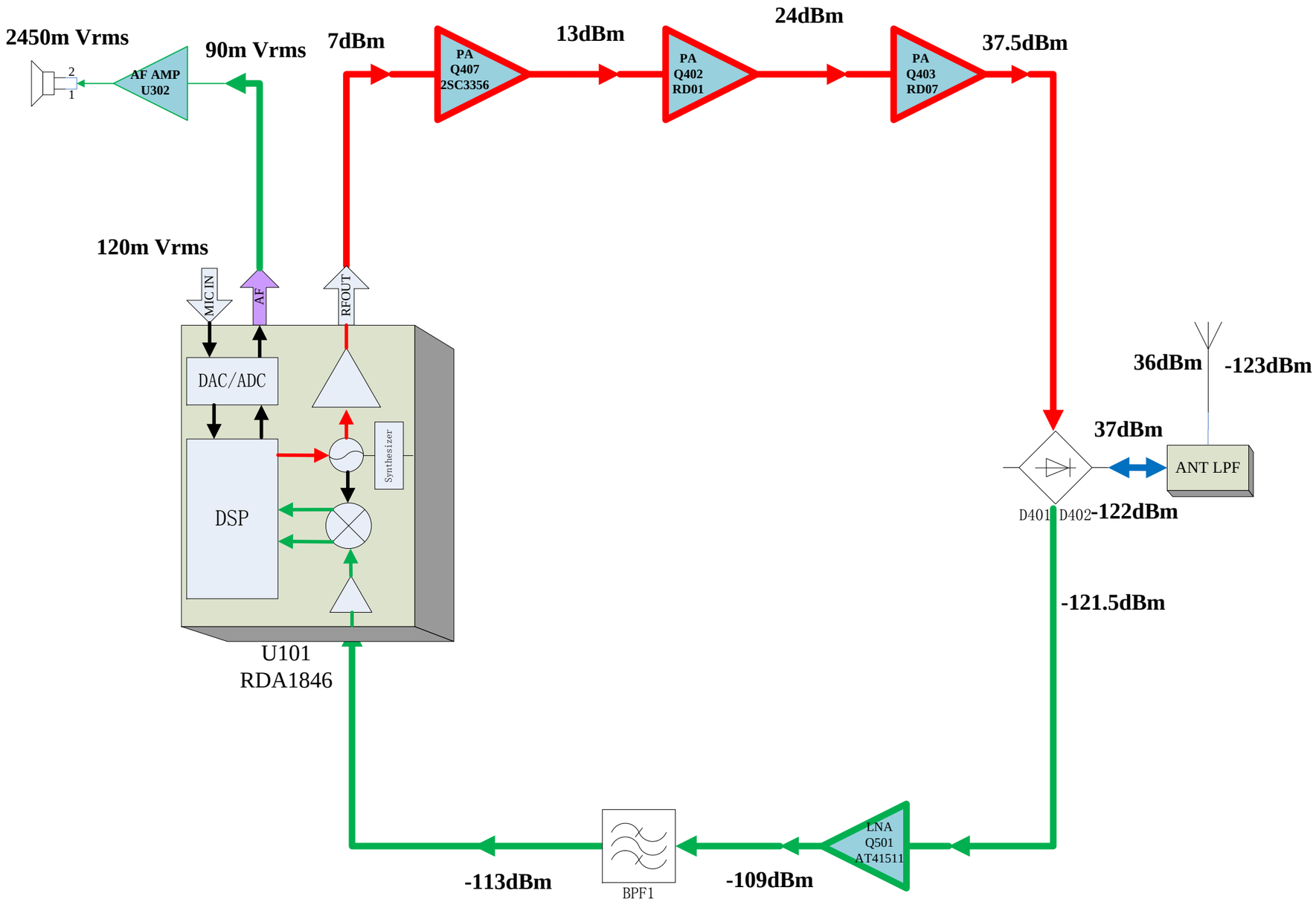


PCB View

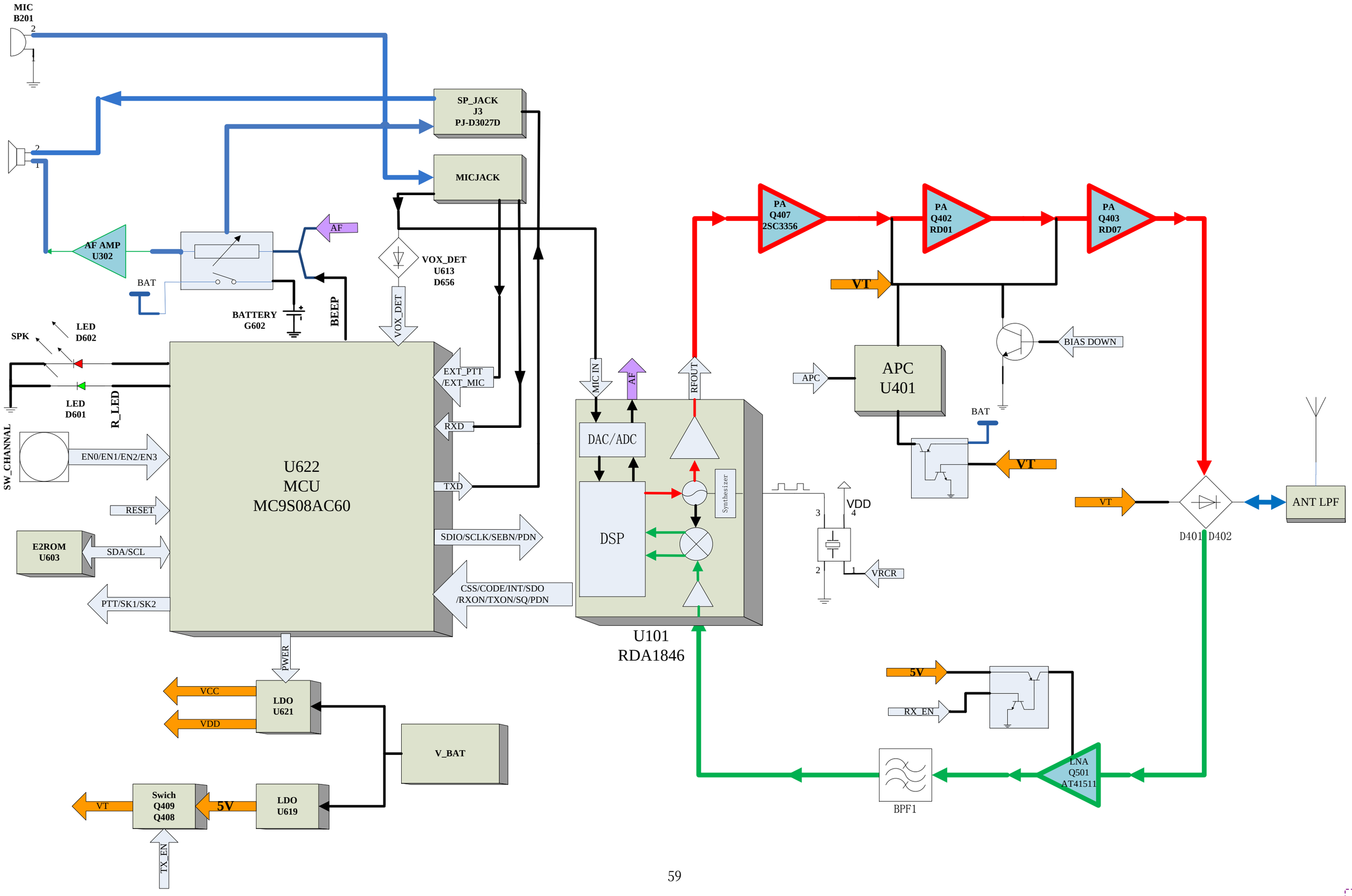
Bottom Layer



14. Level Diagram

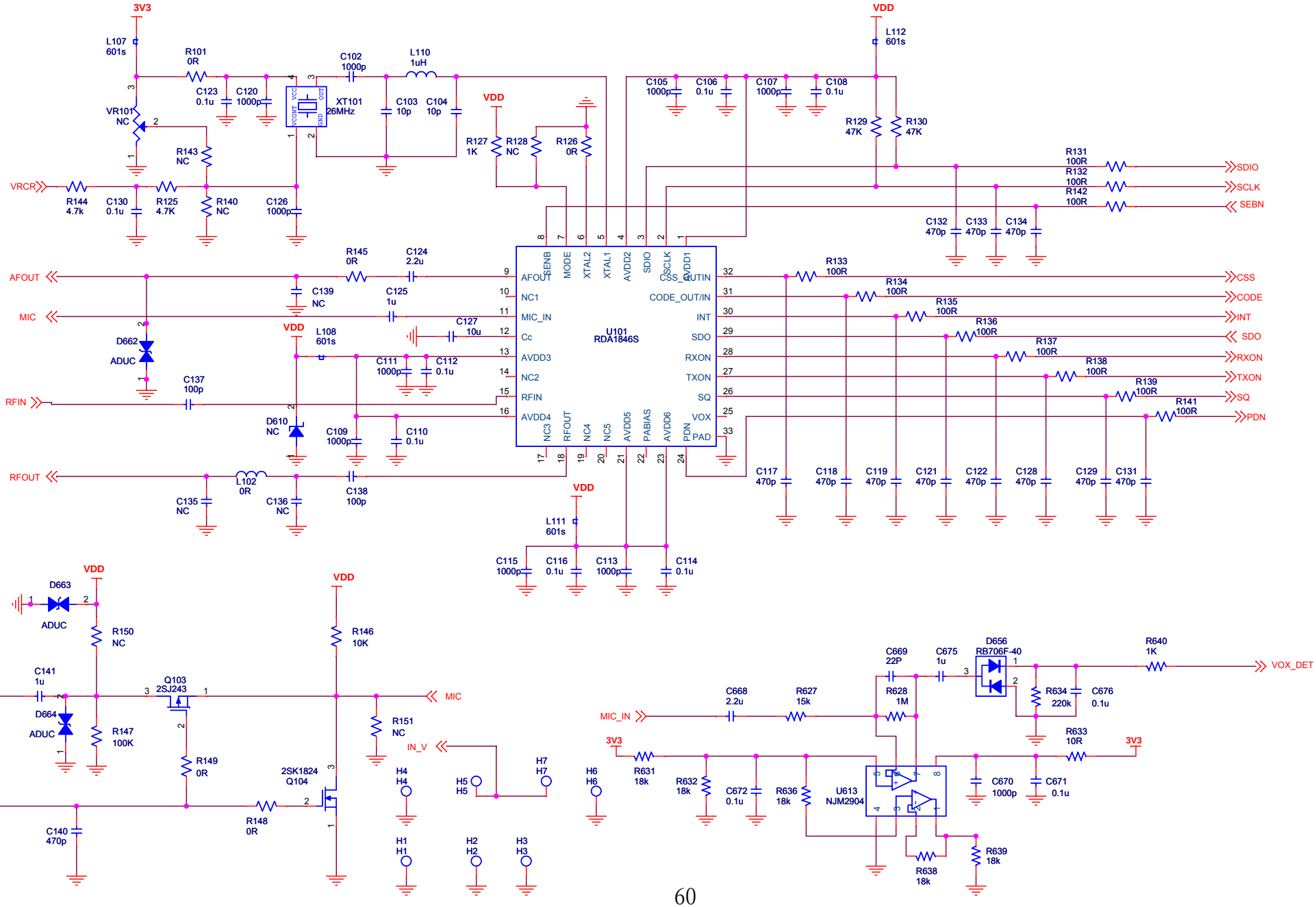


15. Block Diagram

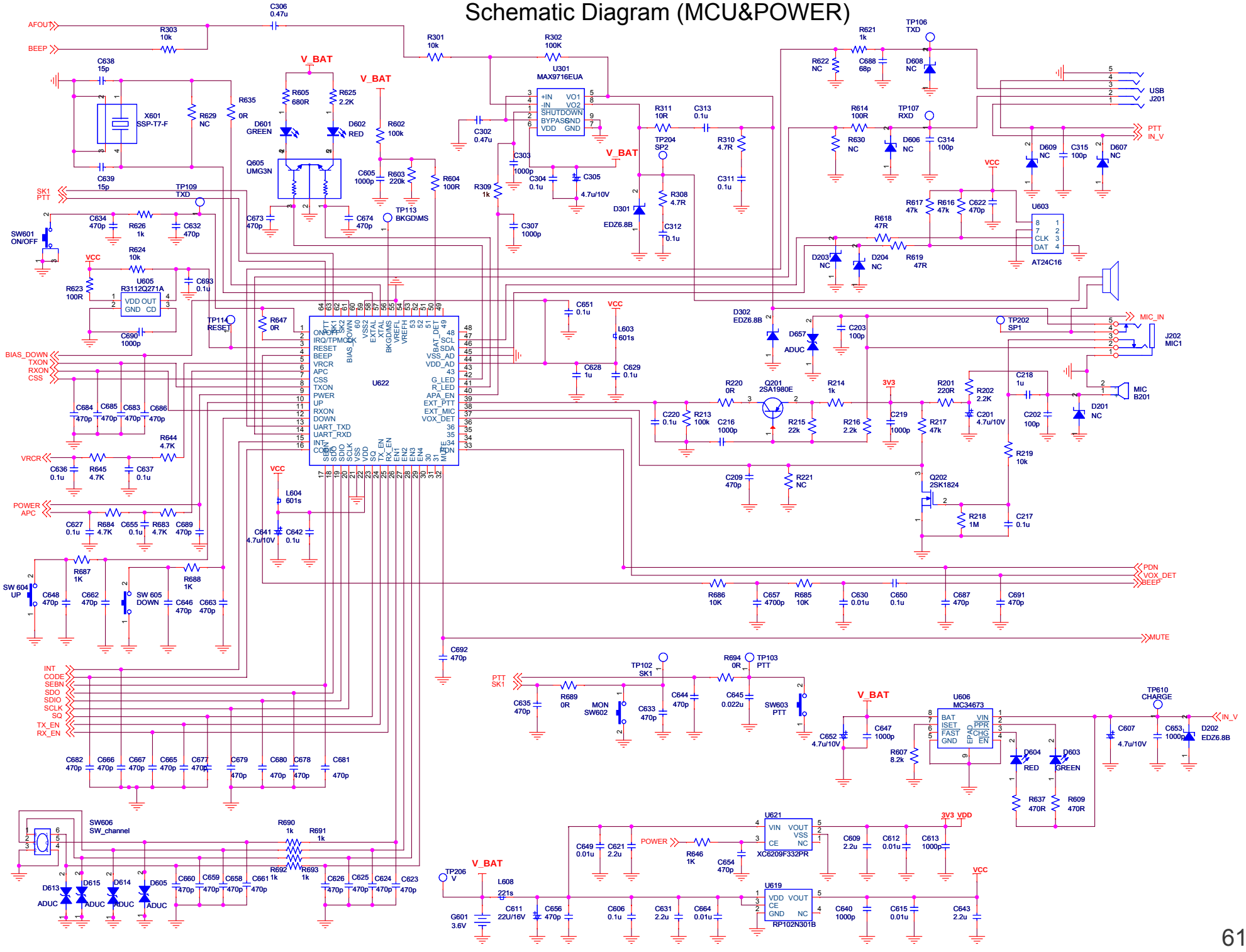


16. Schematic Diagram

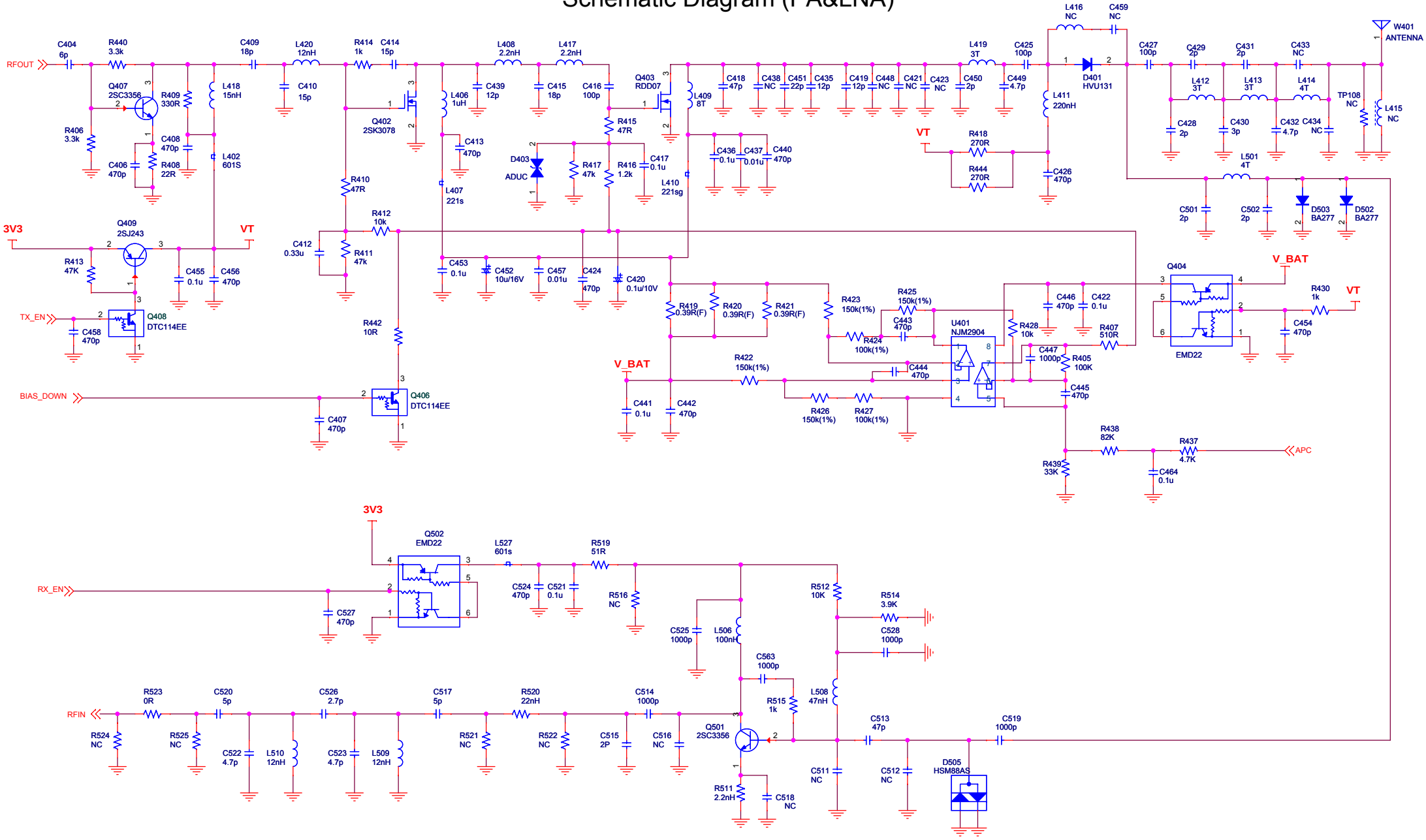
Schematic Diagram (IF)



Schematic Diagram (MCU&POWER)



Schematic Diagram (PA&LNA)



17. Specifications

General	
Frequency Range	400 – 470MHz
Channel Capacity	16
Channel Spacing	25 KHz /12.5KHz
Operating Voltage	3.8V DC
Battery	1650mAh
Battery Life (5-5-90 Duty Cycle)	≥10hours
Operating Temperature	-20℃ – +55℃
Dimensions (H×W×D) (with standard battery, without antenna)	100X48X31mm
Weight (with standard antenna & battery)	145±10g
Frequency Stability	±2.5ppm
Receiver	
Sensitivity	≤0.224μV
Adjacent Channel Selectivity	60dB
Intermodulation	55dB
Spurious Response Rejection	65dB
Max. Audio Power Output	0.7W (Speaker impedance: 4 ohm)
Rated Audio Distortion	≤5%（0.4W）
RX S/N	45dB(W)/40 dB(N)

Transmitter	
RF Power Output	2W
Spurious and Harmonics	≤-26dBm
Modulation Limiting	≤5(W)/≤2.5KHz(N)
FM Noise	≥45(W)/≥40dB(N)
Modulation Distortion	≤5%
Adjacent Channel Power	≤-65(W)/-60dB(N)

Note:

All Specifications are tested according to TIA/EIA-603, and subject to change without notice due to continuous development.

We endeavor to achieve the accuracy and completeness of this manual, but no warranty of accuracy or reliability is given. All the specifications and designs are subject to change without notice due to continuous technology development. Changes which may occur after publication are highlighted by Revision History contained in Service Manual.

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